

High Performance Liquid Chromatograph
Mass Spectrometer

LCMS-8050

APCI-8050

DUIS™-8050

Instruction Manual

Read this manual thoroughly before you use the product.
Keep this manual for future reference.

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Introduction

Read this Instruction Manual thoroughly before using the product.

Thank you for purchasing this product.

This manual describes the installation, operation, usage cautions, accessories and options for this product. Read this manual thoroughly before using the product and operate the product in accordance with the instructions in this manual.

Also, keep this manual for future reference.

Important

- If the user or usage location changes, ensure that this Instruction Manual is always kept together with the product.
- If this manual or a product warning label is lost or damaged, immediately contact your Shimadzu representative to request a replacement.
- To ensure safe operation, read all Safety Instructions before using the product.
- To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, re-installation (after the product is moved) or repairment is required.

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- Note that Shimadzu will not be responsible for the results of operating the product.
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Indications Used in This Manual

Precaution symbols are indicated using the following conventions:

Description	Meaning
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
 NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

The following symbols are used in this manual:

Symbol	Meaning
 Prohibition	Indicates an action that must not be performed.
 Instruction	Indicates an action that must be performed.
 Hint	Indicates information provided to improve product performance.
 Reference	Indicates the location of related reference information.
[]	Indicates buttons, menu items, settings, screens and windows, icon names, and other text displayed on-screen. Example: Click [OK].

Safety Instructions

To ensure safe product operation, read these important safety instructions carefully before use and follow all precaution instructions given in this section.

■ Product Applications

WARNING



Prohibition

Do NOT use the product for purposes other than those specified.

This product is high performance liquid chromatograph mass spectrometer. Using it for an unspecified purpose may result in an accident. This product (including accessories) is manufactured for measuring and industrial purposes, and not suitable for household usage.



Instruction

Safety regulations and standards

For notifications on installation and safety controls, follow the necessary procedures in compliance with the laws and regulations applicable in the country where the product is used.

■ Installation Site

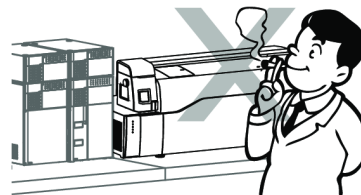
WARNING



Prohibition

Do NOT use naked flames.

The use of naked flames is prohibited at the site where the high performance liquid chromatograph mass spectrometer is installed. You should also avoid installing other equipment that produces a naked flame in the same room. To ensure readiness in the event of an accident, install a fire extinguisher.



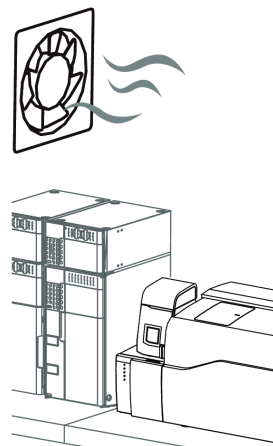
! WARNING



Instruction

Be sure to provide ventilation in the room.

Some of the solvents that are used with a high performance liquid chromatograph mass spectrometer are inflammable or toxic. Also note that this instrument contains a large quantity of nitrogen gas. Its use in a room that is inadequately ventilated could cause oxygen deficiency. Install the instrument in a room that has a ventilation mechanism such as the type of draft chamber in general use (approx. 20 m³/min), and feed the exhaust tube into the draft chamber.



Instruction

Install water supply equipment, such as a wash basin.

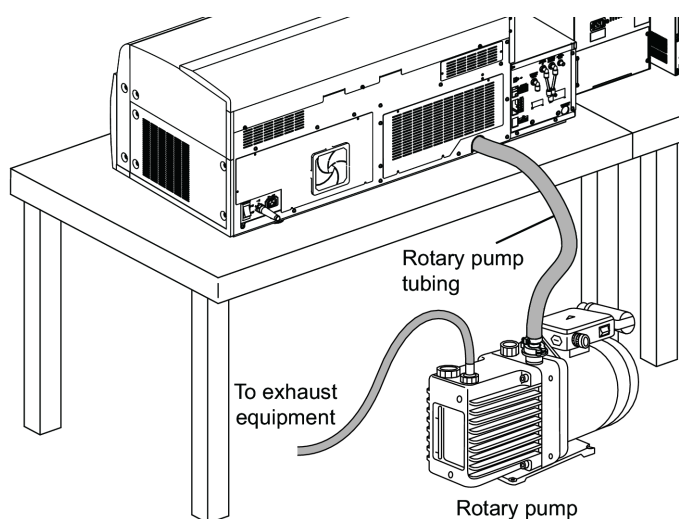
If a solvent gets into someone's eyes or someone touches a toxic solvent, it has to be rinsed away immediately. Install water supply equipment, as a wash basin, such as close to this product as possible.



Instruction

Use a duct system for exhaust.

Be sure to release the exhaust gas from the rotary pump, the solvent vapor that builds up in the waste container, and nitrogen gas into a duct system such as a draft chamber. Be sure to provide separate exhaust channels for the exhaust from the rotary pump and the nitrogen for ionization. Failure to do so will lead to contamination of the mass spectrometer.



Instruction

Keep the ventilation system turned on throughout the night.

Turning off the ventilation system may cause accumulation of the exhaust gas.

! CAUTION

Prohibition

Do NOT install the instrument close to any device that generates a strong magnetic field.

To ensure that the instrument can be operated normally, do not install it at a location where there is a strong magnetic field.

In addition, if there is a lot of noise in the power line add a noise filter.

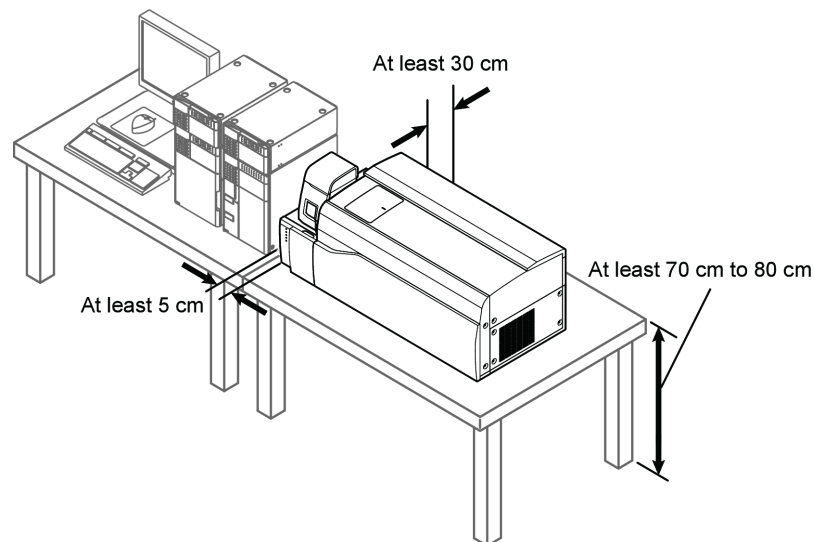


Instruction

Install the product on a desk or table that meets the following requirements.

- **Flat and stable**
Able to comfortably bear the weight of this product (approx. 140 kg) and the entire computer system.
Having a depth of at least 75 cm.
Failing to meet these requirements can cause accidents in which the table collapses or units fall off.
- **Allowing the instrument to be placed a sufficient distance from walls**
Make the distance between the rear face of the instrument and the wall at least 30 cm and the distance between the left and right faces and other units at least 5 cm. If these conditions are not met it will not be possible for the fans to provide adequate air cooling and there will be a risk that the instrument will overheat and its performance will drop.
- **Providing sufficient space for maintenance**
For maintenance purposes a space of at least 30 cm is required to the right of the body of the instrument. Place units that are easy to move, like the computer and printer, on the right side of the instrument body, and place walls and units that are difficult to move at a distance of at least 30 cm from the instrument body.
- **Having an appropriate height**
Use a table with a height of about 70 to 80 cm. Using a table with a height outside this range will impair the operating convenience of the instrument, so care is required.

►► Reference ["9.5 Example Installation" P.242](#)



! CAUTION



Instruction

Install the rotary pump on a stable floor.

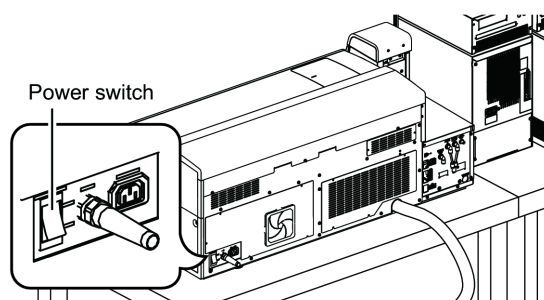
Make the distance between the body of the instrument and the rotary pump a distance over which the tubing provided as an accessory can be connected. If the tubing is extended the intended performance of the machine cannot be guaranteed.



Instruction

Install the instrument so that the power switch can be operated easily.

If the power switch is difficult to operate, it will not be possible to switch the power off immediately in an emergency.



Instruction

Observe the installation conditions.

- A room with a temperature within the range 18 to 28 °C and where the change in room temperature throughout the day is small
Note that temperature changes over a short time can cause instability in the instrument. In order to ensure that stable analysis is performed, make sure that changes in temperature over a short period of time do not exceed 3 °C.
- A location where the instrument is not directly exposed to the airflow from a heater/air conditioner
- A location not exposed to direct sunlight
- A location where there is little vibration
- A location where the humidity remains within the range 20 to 70 % (no dew condensation or electrostatic discharge)
- A location free from corrosive gas, contaminants and dust

■ Installation

! WARNING

Prohibition

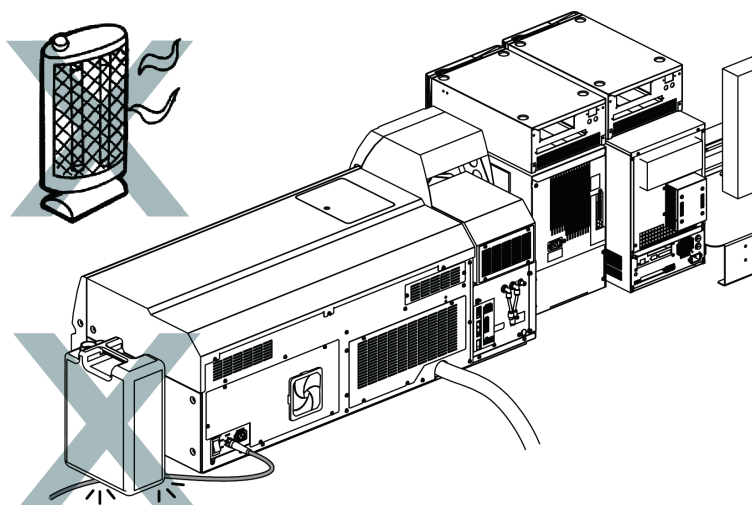
Do NOT share the power supply to this product with any other equipment. The electric capacity of the instrument must not exceed the stipulated capacity of the earth leakage breaker.

Do NOT rest anything heavy on the power cable.

Do NOT run the power cable close to any heat-generating equipment.

Such treatment could damage the cable, leading to fire, electric shock or instrument failure.

If the cable becomes damaged, contact your Shimadzu representative immediately.



Instruction

Contact us or your Shimadzu service representative regarding installation, adjustment, or re-installation inquiries.

Carrying out such work on your own may result in personal injury or damage to the product. Correct installation, adjustment, and re-installation are important to ensure stable operation of the instrument.



Instruction

Adopt measures to prevent the product falling in the event of an earthquake.

The product may fall or drop due to vibration, and this may cause personal injury.



Instruction

Connect the instrument to a compatible power supply.

This product has a power supply voltage of 230 V AC (50/60Hz) at 15 A and power consumption of 3 kVA and 50/60Hz.

Due to the possibility of supply voltage differences, check the instrument name plate and instrument specifications to confirm the suitable power supply for connection. A supply that is not compatible will cause fire or electric shocks.

If the power supply voltage is unstable or the power supply capacity is insufficient, the intended performance of the instrument cannot be guaranteed. The instrument itself may also be damaged. You must check the power supply capacity of the system as a whole and prepare an appropriate supply.

 WARNING

Instruction

The power supply that you connect to must be equipped with an earth leakage breaker.



Instruction

The instrument must be grounded (earthed).

If you do not ground it, there will be a risk of instrument failure and electric shock in the event of current leaks. It is also essential to ground the instrument in order to stabilize it.

▶▶ Reference ["8.1.1 Conditions for the Installation Site" P.198](#)



Instruction

Use the power cord specified or provided by Shimadzu.

Failing to do so may result in electric shock or fire.

Do NOT use the power cord specified or provided by Shimadzu for other devices.

This product (including accessories) is manufactured for measuring and industrial purposes, and not suitable for household usage.

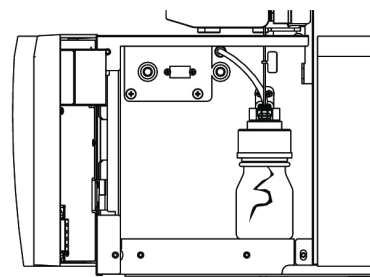
■ Operation

! WARNING

Prohibition

Do NOT use the standard sample bottle if it is cracked.

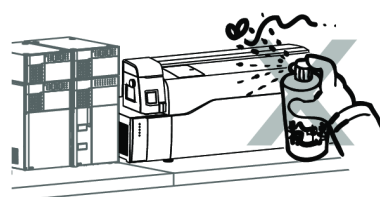
Doing so could ignite and cause a fire. Never use cracked standard sample bottles. When pressure is exerted on the bottle, it may break and cause injury.



Prohibition

Do NOT use flammable sprays.

Do NOT use flammable sprays (hair sprays, insecticide sprays, etc.) near the instrument. They could ignite and cause a fire.



Prohibition

Do NOT use any solvents near the computer or printer.

Doing so could cause fire or electric shock.



Instruction

Provide electrostatic protection.

Take thorough measures to prevent buildup of static electricity. Static electricity could result in fire or explosion.

▶▶ Reference ["Static Electricity Precautions"](#)
P.xiii



Instruction

Wear protective goggles and protective gloves.

Always wear protective gloves and protective goggles when handling solvents and samples. If solvent gets into the eyes, blindness could result. Should solvent get into the eyes, flush immediately with large amounts of water and get medical attention. Always wear protective gloves when handling any toxic or biologically infectious samples.



Instruction

Backup data periodically.

The contents of the PC's hard disk may be lost as the result of an unforeseen accident. Always create a backup to protect critical data from such accidents.

■ Inspection and Maintenance

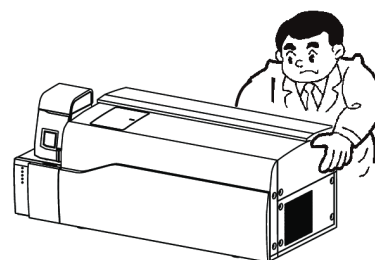
⚠ WARNING



Prohibition

Never remove the cover from the instrument.

Doing so may cause personal injury or damage to the spectrometer. The cover does not need to be removed for routine maintenance or inspection. Repairs inside the product must be performed by Shimadzu service personnel. Contact your Shimadzu representative.



Prohibition

Do NOT disassemble or modify the product without permission.

Otherwise, you may receive an electric shock or a short circuit may occur. Personal injury or product damage can also result.



Instruction

Use the specified parts only.

Replacement parts must be of the specifications given in "Component Parts" or "Maintenance Parts". Use of any other parts may result in malfunction in the instrument.



Prohibition

Do NOT leave the instrument in wet condition nor use alcohol or thinner solvents for cleaning the instrument.

Doing so could cause rust formation or discoloration. To clean the instrument, wipe it with a soft cloth moistened with a small amount of water or neutral detergent, and then wipe it with a soft dry cloth.



Prohibition

Do NOT dispose of waste liquids illegally.

Dispose of the waste liquid properly in accordance with the regulations and instructions issued by your administrative department.



Instruction

Turn the instrument's high voltage or power switch OFF before inspection, maintenance or part replacement.

Otherwise, electric shock or short-circuit accidents could occur.

■ Hazards Involved in Repair, Disassembly, or Modification

⚠ WARNING



Prohibition

Do NOT disassemble or modify the product without permission.

Otherwise, you may receive an electric shock or a short circuit may occur. Personal injury or product damage can also result.



Instruction

Contact us or your Shimadzu service representative for repair inquiries.

Unauthorized repairs may cause a fire, electric shock, or injury.

■ In the Event of an Emergency

Take the following action in the event of an emergency, such as when a problem is found with the high performance liquid chromatograph mass spectrometer.

Perform a full inspection before using the product again, and if necessary, contact your Shimadzu representative.

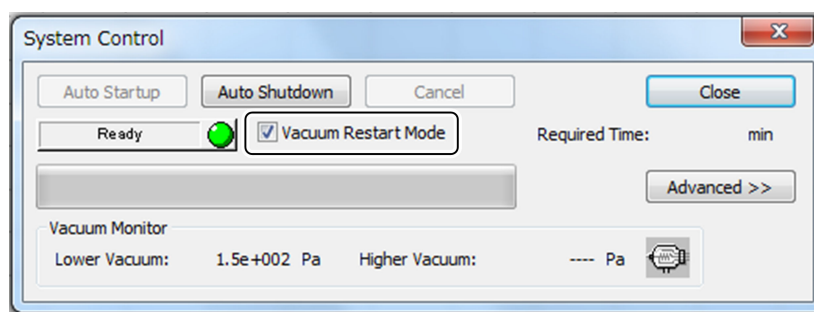
Emergency stop procedure

- 1 Turn OFF the power switches at the mass spectrometer LCMS-8050 as well as the high performance liquid chromatograph units.
- 2 Turn OFF all the power switches at the peripheral equipment.
- 3 Close the main cock of the gas tubing.
- 4 Shut the power supply off.
 - If the power cable is fastened to the distribution board, turn OFF the switch at the distribution board.
 - If the power cable is connected with a plug, unplug the power cable.

■ During a Power Outage

If the 230 V AC power supply to the LCMS-8050 has been cut off and LabSolutions is set to the automatic restart mode, the vacuum system will automatically start when the power is restored.

NOTE To set the automatic recovery mode, select [System Control] from the assistant bar in the LabSolutions analysis window and check the [Vacuum Restart Mode] box in the [System Control] window.
If automatic restart is not set, start the instrument by referring to ["3.1 Starting the Instrument" P.44](#).



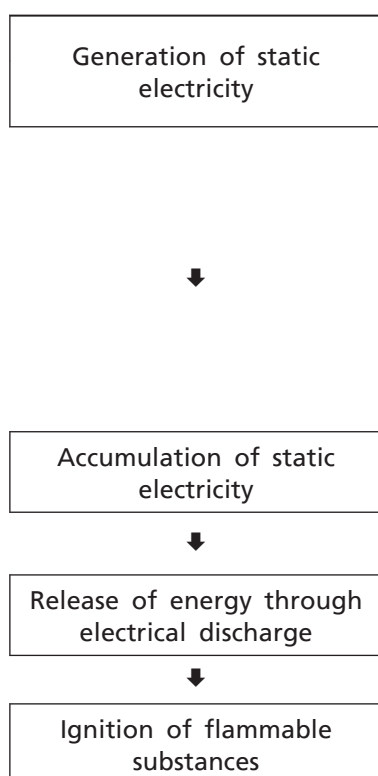
Static Electricity Precautions

A liquid chromatograph (LC) uses flammable organic solvent(s) as the mobile phase. LC systems are also often used where large amount of flammable substances are present. Thus, an accident can produce large scale damage. Operators must be constantly on guard against accidents involving fire or explosion.

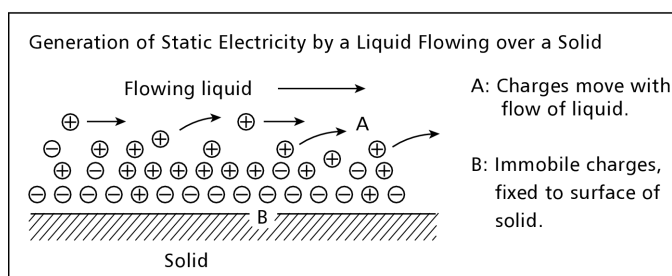
The major cause of these accidents is static electricity. Devising preventative measures for static can be difficult, because the symptoms before an accident vary and can be hard to detect, since such accidents occur as a result of several simultaneous coincidences. Recommended methods for preventing static electricity accidents are provided below. Take thorough safety measures based on this information.

Typical Cause of Static Electricity Accidents

Static electricity accidents are generally caused by this sequence of events:

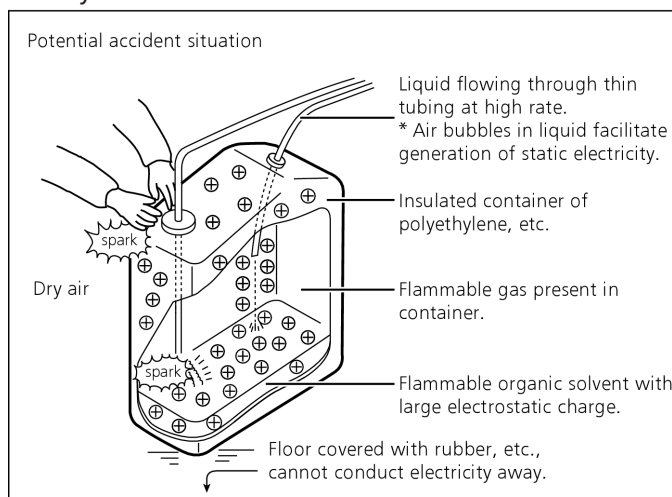


When liquid is passed through thin tubing at high flow rates, as in liquid chromatograph, the electrostatic charges of the flowing matter generate static electricity.



If electrostatically charged liquid is allowed to accumulate in an electrically insulated container, the charge will gradually increase, and can eventually reach several thousand volts.

If this happens and an electrical conductor is brought within a certain distance of the container, an electrical discharge will occur, releasing thermal energy which will ignite any flammable gas of sufficient density in the vicinity.



■ Preventing Static Electricity Accidents

The best way to prevent static electricity accidents is simply to prevent the occurrence and accumulation of electrostatic charges.

! CAUTION



It is important to take multiple preventive measures simultaneously.
If large amounts of flammable solvents are collected in a large container, implement preventive measures 1 - 5 below.

Preventive Measure 1

Use a conductive metal container for the waste liquid, and ground the container. This will ensure that the electrical charges of the container and liquid pass to the ground.

<Optional accessories for this measure>

- Grounding wire with clip Part No.: S228-21353-91
- 18 liter metal container Part No.: S038-00044
- 4 liter metal container Part No.: S038-00043-01

! CAUTION



Be sure to ground the metal waste container properly.

If the grounding wire is not properly attached or connected to the ground, static electricity can build up in the container.



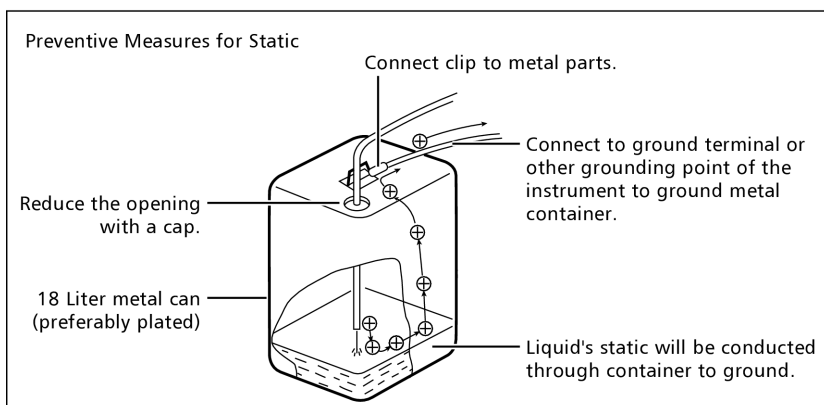
Be sure to use a tester to verify that electricity is conducted to the ground.

Some metal containers have surfaces that are laminated or oxidized, and therefore do not conduct electricity.



If the liquid to be drained into the waste container is virtually non-conductive (10^{-10} S/m or less), it will be necessary to add properly conductive, and therefore safe, liquid to the tank.

This conductive liquid may be added to the waste container beforehand.



Preventive Measure 2

Restrict the openings at the waste container with caps or other protective covering to prevent sparks generated outside the container from getting inside.

<Optional accessories for this measure>

Caps for 18 liter or 4 liter containers

(with three 3 mm diameter openings) Part No.: S228-21354-91

Preventive Measure 3

Keep electrostatically charged objects, including the human body, away from the waste container.

To prevent electrostatic charging of the human body, take the following precautions:

- Wear anti-static clothing and shoes.
- Ground the human body with anti-static wrist straps. (For safety, the wrist strap should be connected to the ground using an intervening resistor of about 1 MΩ.)
- Spread anti-static matting or the like on the floor, to make the floor conductive.

** CAUTION**

Instruction

Provide antistatic measures.

Persons who have not taken anti-static precautions should touch some grounded metal object before coming near the waste container, in order to drain static charges.

Preventive Measure 4

Use tubing with an inner diameter of at least 2 mm for drain lines with high flow rates.

** CAUTION**

Instruction

Periodically check the tubing connections for air bubbles.

Air bubbles in liquid can multiply the electrostatic charge by a factor of 20, 30 or more.

Preventive Measure 5

If it is not possible to use a conductive waste container, take the following precautions: Ensure that the end of the inflow tubing is always submerged inside the container. Also, place some type of grounded metal object, such as a ground wire connected to the instrument, into the liquid.

Note, however, that the above precaution will be ineffective for low conductivity (less than 10^{-10} S/m) liquids.

! CAUTION



Instruction

Keep the room at a proper humidity.

Ambient humidity exceeding 65 % will prevent static electricity.



Instruction

Use as small a waste container as possible.

This minimizes the damage in the event of fire.

<Reference>

Anti-static equipment (anti-static clothing, shoes and matting) and charge measurement equipment (electrometer) are sold by specialty manufacturers.

Precautions for Mobile Phase Selection and Use

CAUTION



Prohibition

If PEEK resin parts are used in the plumbing, do **NOT** use the following mobile phases.

These mobile phases weaken the PEEK resin, which could result in cracked plumbing and mobile phase leaks.
Concentrated sulfuric acid, concentrated nitric acid, dichloroacetic acid, acetone, tetrahydrofuran (THF), dichloromethane, chloroform, dimethyl sulfoxide (DMSO).



NOTE Briefly using a weak solution of less than 0.5 % acetone in water (e.g. in order to check gradient performance) will present no problems.



Instruction

When performing analysis in which a halogenated mobile phase additive is used, note the following:

In the APCI and ESI methods, the analyte is heated to high temperatures. If the mobile phase contains a halogenated compound such as chloroform, a corrosive gas will be produced. Even a small percentage concentration of halogens in the mobile phase can cause corrosion.

Use SUS tubes to connect the high performance liquid chromatograph to the instrument. PEEK resin tubes do not have sufficient strength and should they rupture, solvent may blow out.

Black particles may build up on the APCI unit or ESI unit.

Because of exposure to corrosive gases, you may need to replace parts at a shorter interval than specified.



Prohibition

Do NOT use a mobile phase that contains hexafluoroisopropanol (HFIP).

Plastic connections are used regardless of the tubing material because it may weaken or break the plastic joints resulting in splashing of the solvent.

 NOTE

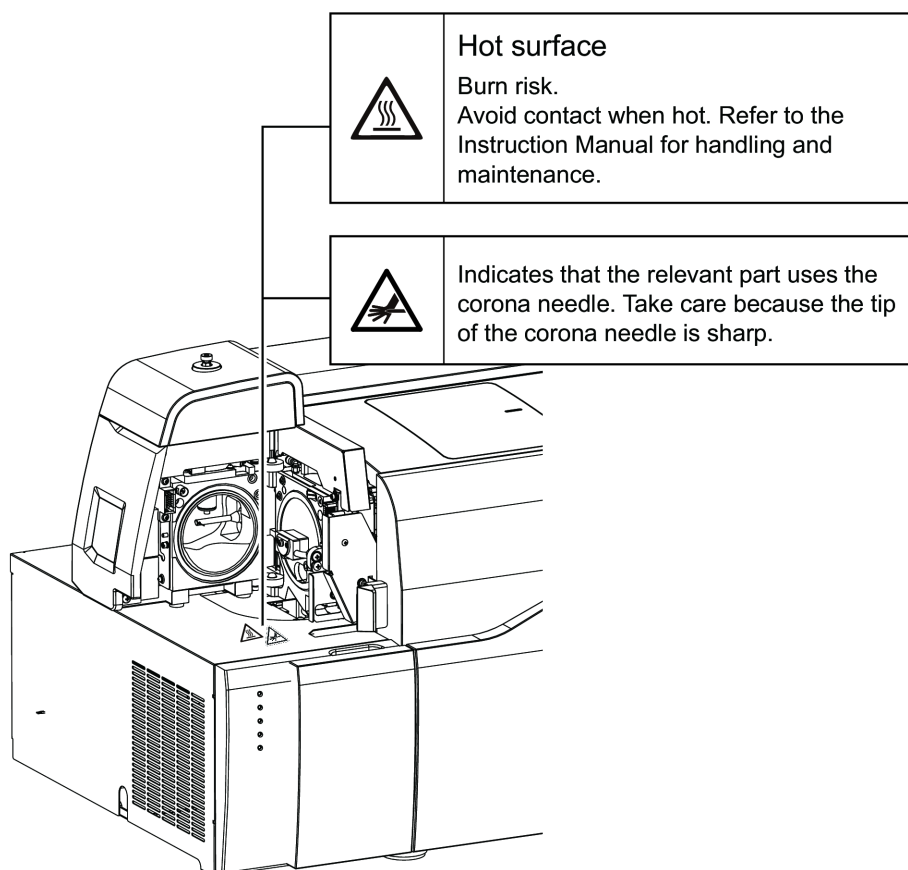
- Select an HPLC compliant or HPLC compatible mobile phase and remove any fine particles and contaminants from the filter (part No.: S228-45707-91) before use.
- Whenever possible, avoid using mobile phases that contain halogen ions, such as KCl, NaCl and NH_4Cl , or that generate halogen ions in certain reactions. Halogen ions can corrode the stainless steel material (SUS316L) used in plumbing. If such mobile phases must be used, clean all flow lines thoroughly with distilled water immediately after analysis.
- A less volatile buffer solution (such as phosphate buffer solution) will cause precipitation at the interface area, which will decrease sensitivity. Avoid less volatile buffer solutions.
- Trifluoroacetic acid (TFA) and ion pair reagent, which tend to remain in the instrument, may affect other analyses.
- Always degas the mobile phase, as air bubbles may tend to form during solvent mixing or during temperature or pressure changes. Air bubbles may cause pump malfunctions and detector signal noise.
- For information on the characteristics of the mobile phase to be used, such as its boiling point or viscosity, refer to the "Mobile Phase Characteristics" section in the relevant instruction manual of the high performance chromatograph system you are using.
- Mobile phase solvents must be used in a pH range of 2 to 10. If a mobile phase solvent is used at high or low pH, corrosion may occur on the aluminum surface. If corrosion on the aluminum surface is observed, wipe the surface clean. If necessary, polish the surface with lapping film.
- Discoloration due to corrosion will not affect the performance of the system.

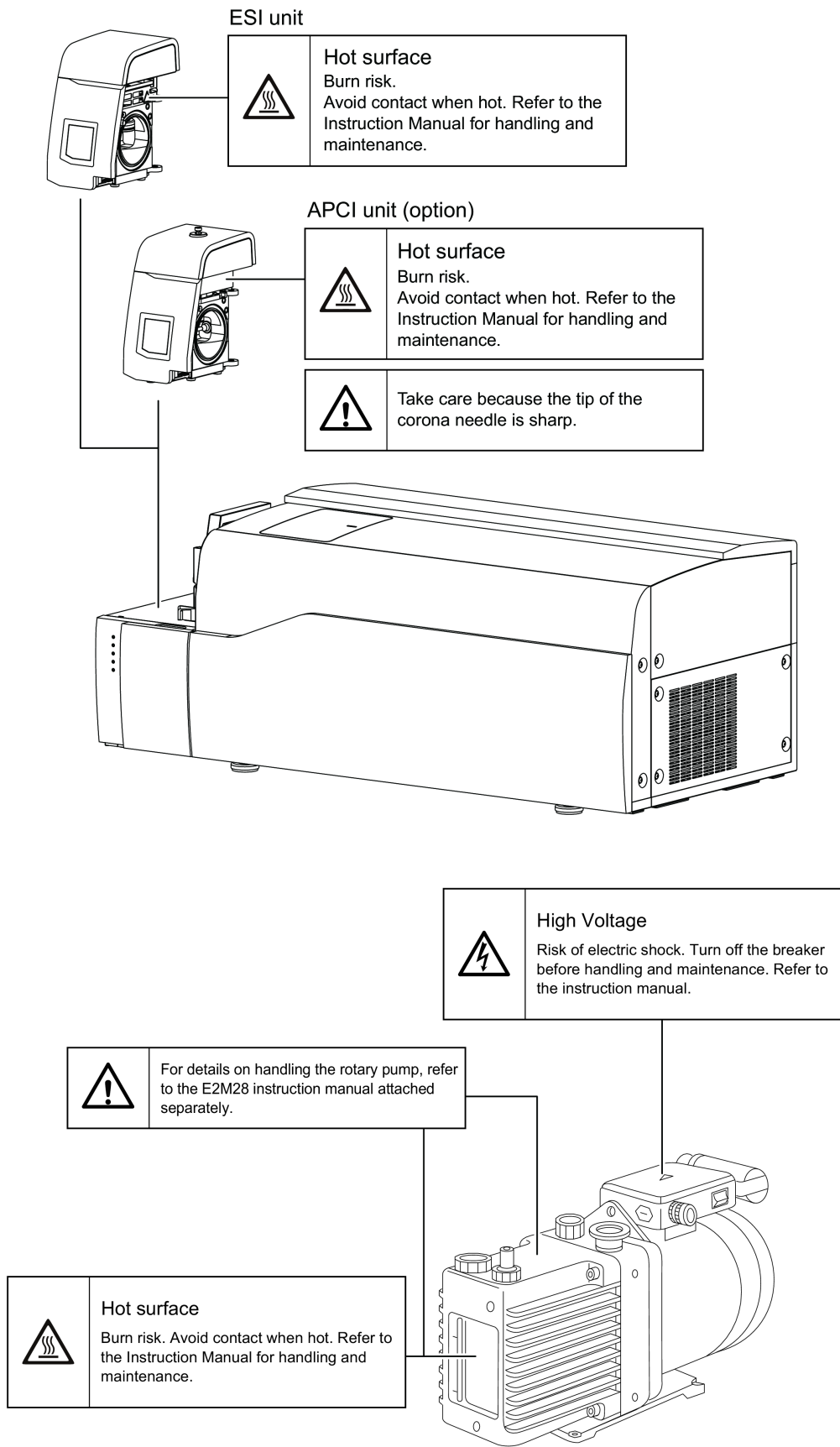
Warning Labels

For safe operation, warning labels are affixed where special attention is required. Should any of these labels peel off or be damaged, obtain replacements from your Shimadzu representative.

When handling or operating the instrument, thoroughly read the Instruction Manual and follow the instructions given.

Symbol	Meaning
	Indicates that lethal voltage is present.
	Indicates that some parts will reach high temperatures.
	Refer to the Instruction Manual when handling or operating any section marked with this symbol.
	Indicates that the relevant part uses the corona needle.



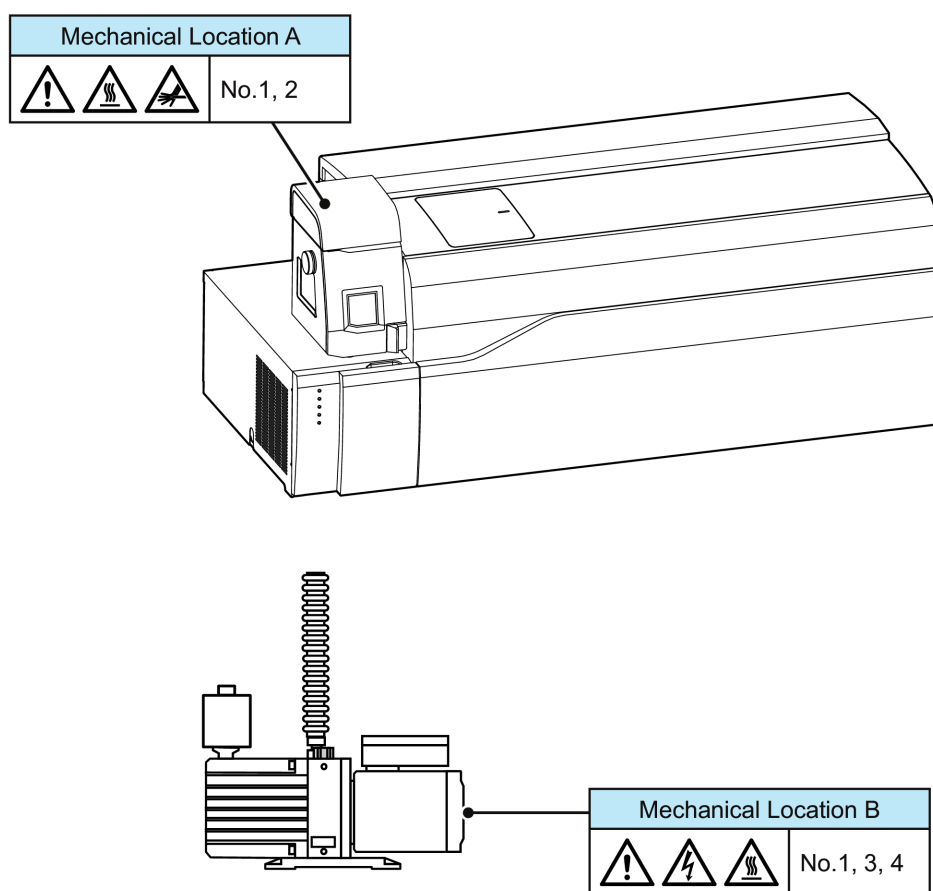


Residual Risk Information

A residual risk indicates a risk that could not be reduced or eliminated in the process of design and manufacture. Check the risk locations in "Residual Risk Map", and take the relevant protective measures described in "List of Residual Risks".

■ Residual Risk Map

The "Mechanical Location" and "No." indicated below are in accordance with those in "List of Residual Risks". For details, see "List of Residual Risks".



■ List of Residual Risks

The "No." and "Mechanical Location" indicated below are in accordance with those in "Residual Risk Map". Be sure to check the actual "Mechanical Location" referring to "Residual Risk Map".

Furthermore, read through and understand the content in "Reference" to take appropriate protective measures.

Operation

No.	Mechanical Location	Description	Protective Measure taken by machine user	-	-
1	A, B	 Touching high temperature parts of the heater for heating gas, APCI heater, DL, block heater, and rotary pump may cause burn.	• Avoid contact when hot. • Refer to the Instruction Manual for handling and maintenance.	Reference	P.xix
				Operation Category	Analysis, Maintenance
				Required Qualification/ Education	Qualified person received training to use the instrument Service personnel
2	A	 Injury due to the corona needle.	Take care because the tip of the corona needle is sharp.	Reference	P.xix
				Operation Category	Analysis, Maintenance
				Required Qualification/ Education	Qualified person received training to use the instrument Service personnel

Maintenance

No.	Mechanical Location	Description	Protective Measure taken by machine user	-	-
3	B	 The rotary pump may fall, resulting in injury or damage to the instrument.	Contact us or your Shimadzu service representative regarding installation, adjustment, or re-installation inquiries.	Reference	P.xix
				Operation Category	Re-installation Maintenance
				Required Qualification/ Education	Service personnel
4	B	 Electric shock or short-circuiting may result in an accident.	Do Not disassemble or modify the product without permission. Contact us or Shimadzu service representative for repair inquiries.	Reference	P.xix
				Operation Category	Maintenance
				Required Qualification/ Education	Service personnel

Warranty

Shimadzu provides the following warranty for this product.

1. Period:

Please contact your Shimadzu representative for information about the period of this warranty.

2. Description:

If a product/part failure occurs for reasons attributable to Shimadzu during the warranty period, Shimadzu will repair or replace the product/part free of charge. However, in the case of products which are usually available on the market only for a short time, such as personal computers and their peripherals/parts, Shimadzu may not be able to provide identical replacement products.

3. Limitation of Liability:

- (1) In no event will Shimadzu be liable for any lost revenue, profit or data, or for special, indirect, consequential, incidental or punitive damages, however caused regardless of the theory of liability, arising out of or related to the use of or inability to use the product, even if Shimadzu has been advised of the possibility of such damage.
- (2) In no event will Shimadzu's liability to you, whether in contract, tort (including negligence), or otherwise, exceed the amount you paid for the product.

4. Exceptions:

Failures caused by the following are excluded from the warranty, even if they occur during the warranty period.

- (1) Improper product handling
- (2) Repairs or modifications performed by parties other than Shimadzu or Shimadzu designated companies
- (3) Product use in combination with hardware or software other than that designated by Shimadzu
- (4) Computer viruses leading to device failures and damage to data and software, including the product's basic software
- (5) Power failures, including power outages and sudden voltage drops, leading to device failures and damage to data and software, including the product's basic software
- (6) Turning OFF the product without following the proper shutdown procedure leading to device failures and damage to data and software, including the product's basic software
- (7) Reasons unrelated to the product itself
- (8) Product use in harsh environments, such as those subject to high temperatures or humidity levels, corrosive gases, or strong vibrations
- (9) Fires, earthquakes, or any other act of nature, contamination by radioactive or hazardous substances, or any other force majeure event, including wars, riots, and crimes
- (10) Product movement or transportation after installation
- (11) Consumables and equivalent items

Recording media such as floppy disks and CD-ROMs are considered consumable items.

- * If there is a document such as a warranty provided with the product, or there is a separate contract agreed upon that includes warranty conditions, the provisions of those documents shall apply.

After-Sales Service and Availability of Replacement Parts

■ After-Sales Service

If any problem occurs with this product, perform an inspection and take appropriate corrective action as described in the section "[6 Troubleshooting](#)" P.107.

If the problem persists, or the symptoms are not covered in the troubleshooting section, contact your Shimadzu representative.

■ Replacement Parts Availability

Replacement parts for this product will be available for a period of seven (7) years after the product is discontinued. Thereafter, such parts may cease to be available.

If Shimadzu receives notice of the discontinuation of units or parts, the necessary quantity for the above period is immediately calculated and secured. However, such units or parts may cease to be available within seven years after the discontinuation of the product, depending on the conditions of individual manufacturers and on changes in the quantity required.

Maintenance, Inspection, and Servicing

To prolong instrument performance and to obtain the correct measurement data, you need to carry out daily and periodic inspections as well as periodic calibrations.

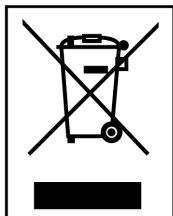
- For information on daily maintenance and inspection and replacement parts, see Chapter "[7 Maintenance](#)" P.119 and Chapter "[10 Maintenance Parts](#)" P.243.
- Periodic inspection/calibration should be requested to your Shimadzu representative.
- Replacement cycles described for periodic replacement parts are rough estimate. Replacement may be required earlier than the described replacement cycles depending on usage environment and frequency.

Disposal Precautions

This product must be disposed of in compliance with the respective national or local government regulations.

Action for Environment (WEEE)

■ To all users of Shimadzu equipment in the European Union:



WEEE Mark

Equipment marked with this symbol indicates that it was sold on or after 13th August 2005, which means it should not be disposed of with general household waste. Note that our equipment is for industrial/professional use only.

Contact Shimadzu service representative when the equipment has reached the end of its life. They will advise you regarding the equipment take-back.

With your co-operation we are aiming to reduce contamination from waste electronic and electrical equipment and preserve natural resources through re-use and recycling. Do not hesitate to ask Shimadzu service representative, if you require further information.

Electromagnetic Compatibility

This product complies with European standard EN61326-1, class B for electromagnetic interference (Emissions) and minimum requirement for electromagnetic susceptibility (Immunity).

■ EN55011 Emissions (Electromagnetic Interference)

This is a class B product and is not designed for use in a residential environment. When this product causes an electromagnetic disturbance to devices being used near this product, create an appropriate distance between those devices and this product in order to eliminate the disturbance.

■ EN61326-1 Immunity (Electromagnetic Susceptibility)

Compliance with these standards does not ensure that the product can operate at a level of electromagnetic interference that is stronger than the level tested. Interference stronger than the values specified above may cause the product to malfunction.

When installing or using this product, especially in an industrial location:

Locate the product away from any device emitting strong levels of electromagnetic noise. Use a power source that is separated from the power source of any device emitting strong levels of electromagnetic noise.

To prevent static electricity:

Prior to touching the product, the operator should be sure to discharge the static electricity stored in their body by first touching a grounded metallic structure. Do not touch any terminals or connectors that are not connected to cables while the product is turned ON.

Regulatory Information

For Europe:

The product complies with the following requirements.

EMC Directive

Low Voltage Directive

RoHS Directive

Product Name	High Performance Liquid Chromatograph Mass Spectrometer
Model Name	LCMS-8050
Manufacturer	SHIMADZU CORPORATION ANALYTICAL & MEASURING INSTRUMENTS DIVISION
Address	1 NISHINOKYO-KUWABARACHO NAKAGYO-KU KYOTO 604-8511 JAPAN
Authorized Representative in EU	Shimadzu Europa GmbH
Address	Albert-Hahn-Strasse 6-10, 47269 Duisburg, F.R. Germany

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10**Maintenance Parts**

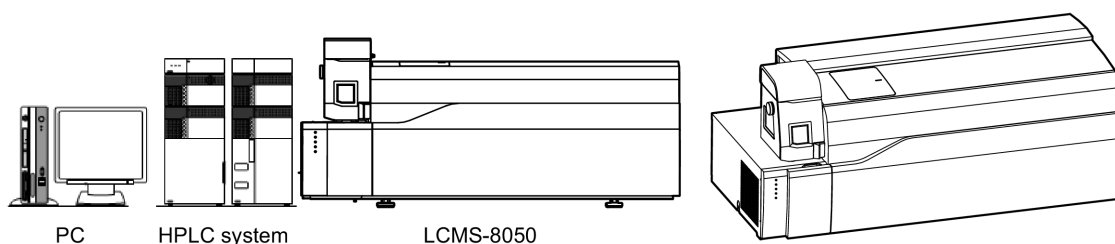
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1 Outline and Configuration

1.1 Outline

The Shimadzu LCMS-8050 is a triple quadrupole mass spectrometer. The LCMS-8050 not only takes advantage of Shimadzu's high-speed UF Technologies, it also uses a pneumatically and thermally assisted ESI source. With its high sensitivity and UFMS (Ultra Fast Mass Spectrometry) capability, the LCMS-8050 improves data quality, saves time, and increases laboratory productivity.



1.2 Features

High sensitivity

- The thermally assisted ESI probe performs effective ionization and increases the number of ions.
- The UF-Lens ion transport system effectively delivers a large number of ions to the mass separation unit.
- The mass separation unit, with its high-precision hyperbolic quadrupole, achieves mass separation with high sensitivity.

The UFsweeper III collision cell effects highly sensitive transport. All Shimadzu technologies incorporated in the LCMS-8050 support high sensitivity analysis.

High throughput

Using Shimadzu's proprietary UF technologies, the LCMS-8050 achieves ultra fast MRM (555 MRM/sec), ultra fast polarity switching (5 msec), and ultra fast scan speed (30,000u/sec). You will never miss sharp peaks when used in combination with Shimadzu's ultra fast LC series.

Ruggedness and stability

After being sprayed and ionized by the atmospheric pressure ionization probe, the sample passes through the sample introduction unit (DL) oriented at 90°, which efficiently introduces it into the vacuum. Since excess solvent is expelled through the drainage port, the effects of contamination are minimized and stable analysis is possible.

Designed for ease of use

The LCMS-8050 employs a cableless ionization unit system, which facilitates the replacement, installation, removal, and daily maintenance of each ionization unit.

The LabSolutions software package enables easy control of the liquid chromatograph (LC) and mass spectrometer (MS) units, analysis, data processing, and report creation.

1.3 Mechanism of Analysis

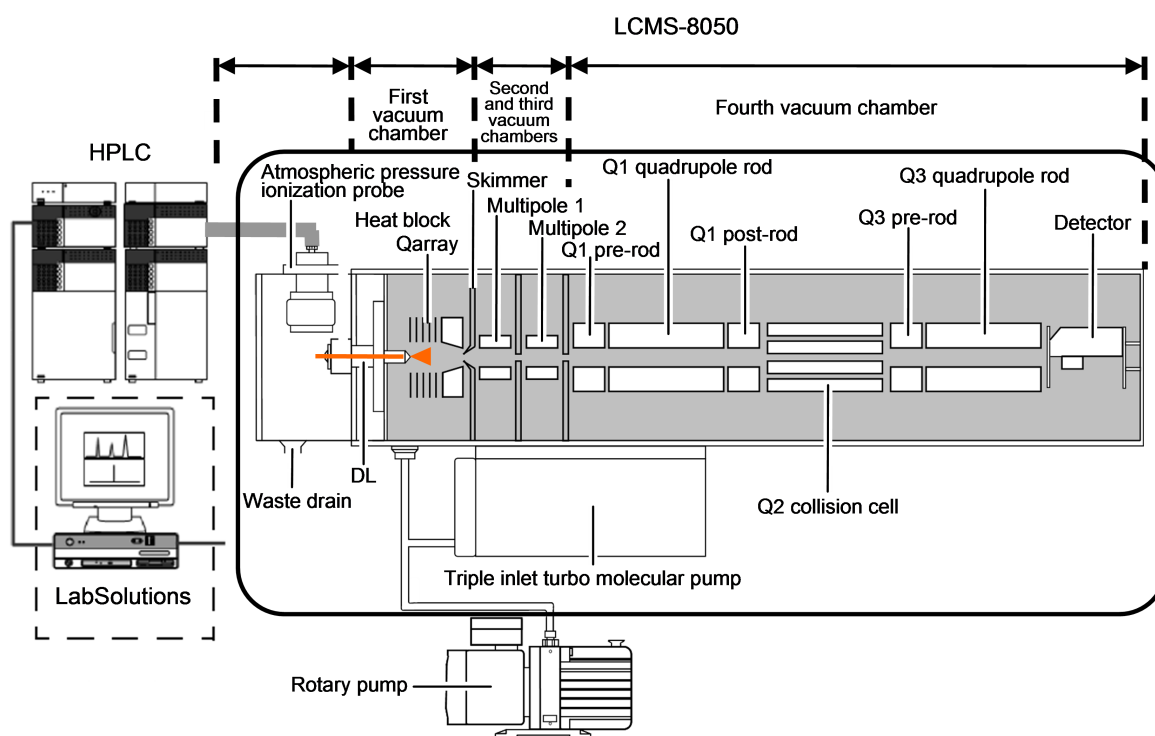
The sample introduced from the liquid chromatograph is sprayed and ionized under atmospheric pressure by the atmospheric pressure ionization probe (e.g. ESI or APCI probe).

The ionized sample is introduced through the sample introduction unit (DL), which is oriented at 90° to the spray, into the first stage primary vacuum chamber, where it is efficiently focused at the tip of the skimmer by the Qarray where multi-stage high frequency ion guides are arranged.

The rear section of the skimmer passes through the high frequency ion guides (multipoles) arranged in the second and third vacuum chambers.

Subsequently, the ions are separated according to their mass-to-charge ratio (m/z) by the quadrupole mass filter with pre-rod and the collision cell and are detected by the detector.

The detected ion signals are first amplified by the amplifier and then processed by the LabSolutions data processing software.



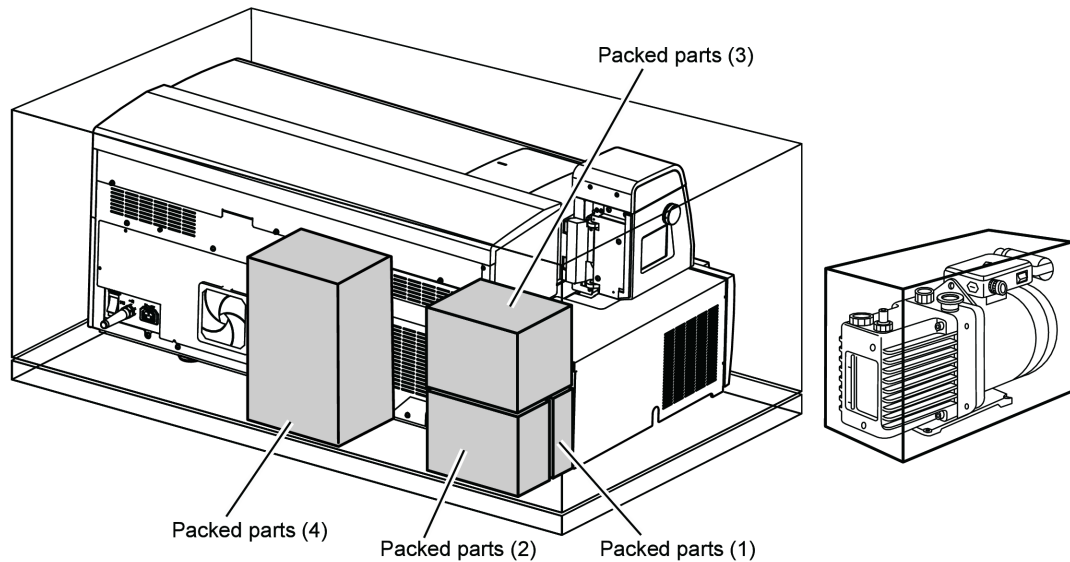
Configuration of the LCMS-8050 Unit

1.4 Component Parts

This product is composed of the following parts. When unpacking the product, check the details and quantity of each item.

Packed parts

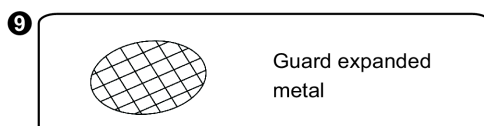
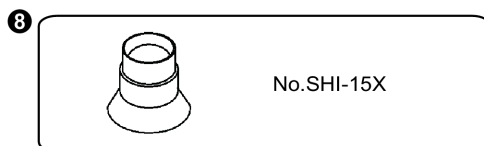
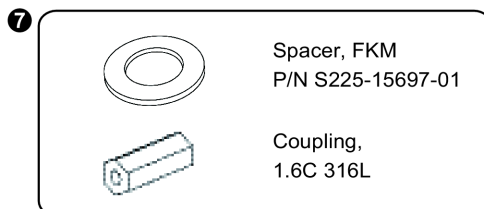
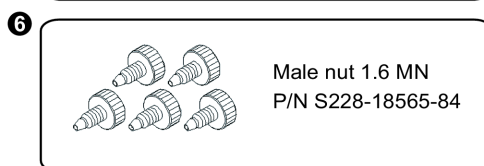
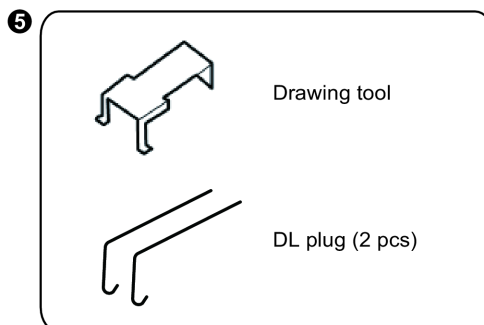
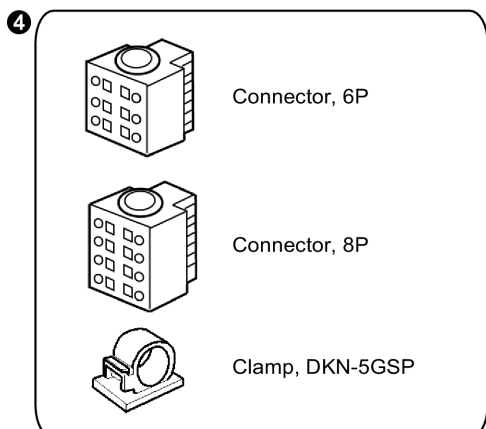
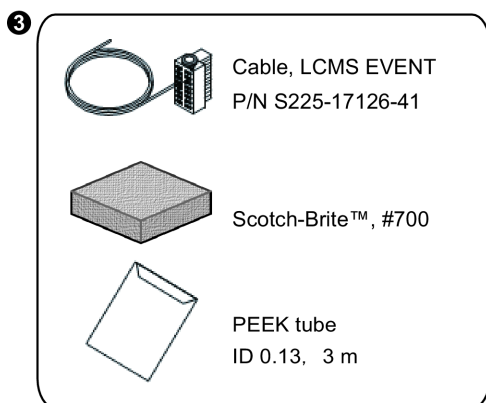
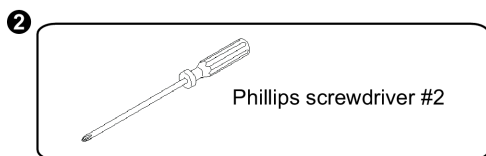
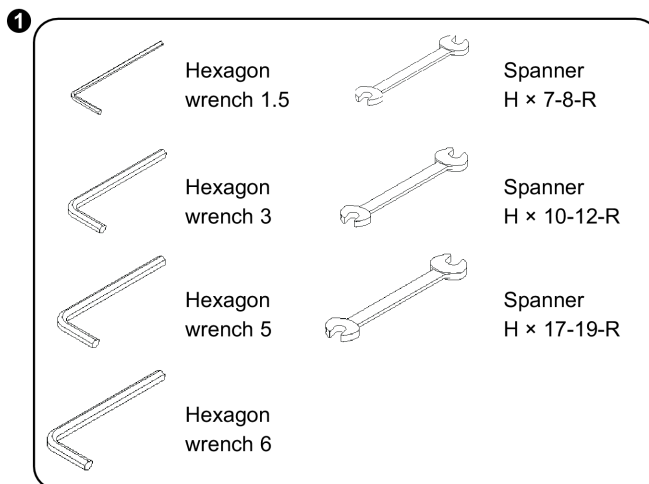
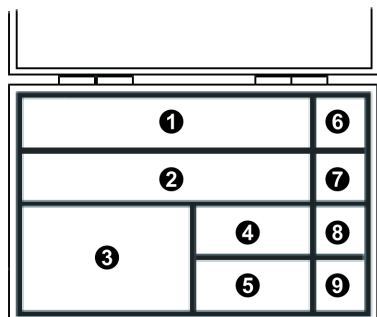
Part Name	Part No.	Q'ty	Remarks
• LCMS-8050 • Packed parts (1) • Packed parts (2) • Packed parts (3) • Packed parts (4)	-	1	230 V AC, 50/60 Hz
Rotary pump E2M28	-	1	



1.4.1 Packed Parts (1)

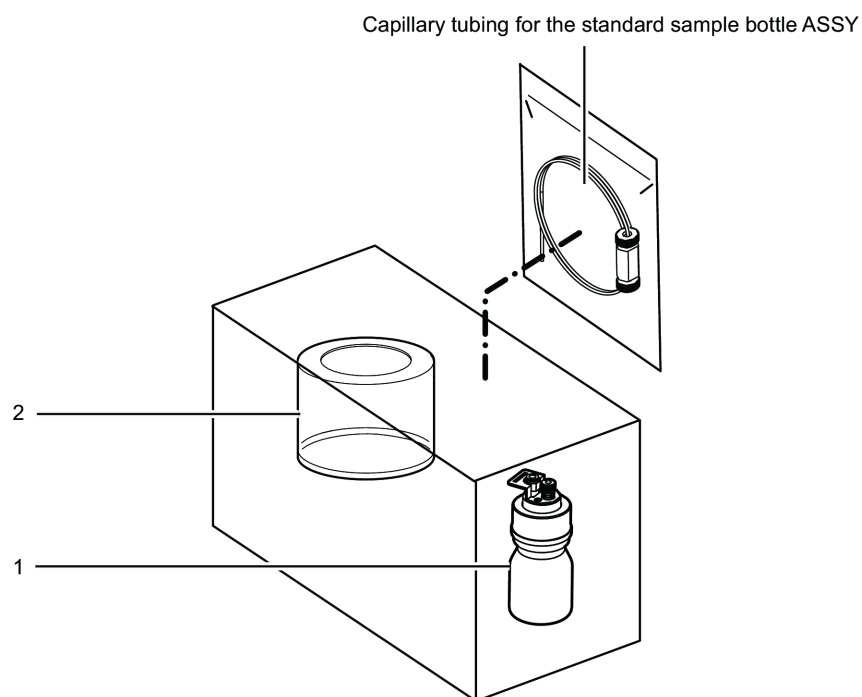
Part Name	Part No.	Q'ty	Remarks
Accessory kit	-	1	Tools

Accessory kit details



1.4.2 Packed Parts (2)

No.	Part Name	Part No.	Q'ty	Remarks
1	Standard sample bottle ASSY	-	1	Includes capillary tubing
2	Stand	-	1	Stand



1.4.3 Packed Parts (3)

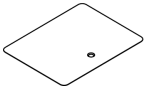
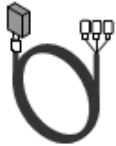
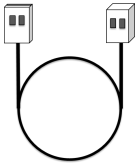
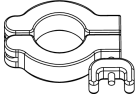
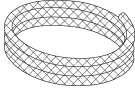
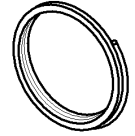
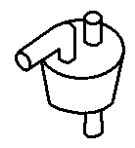
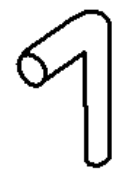
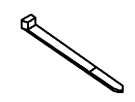
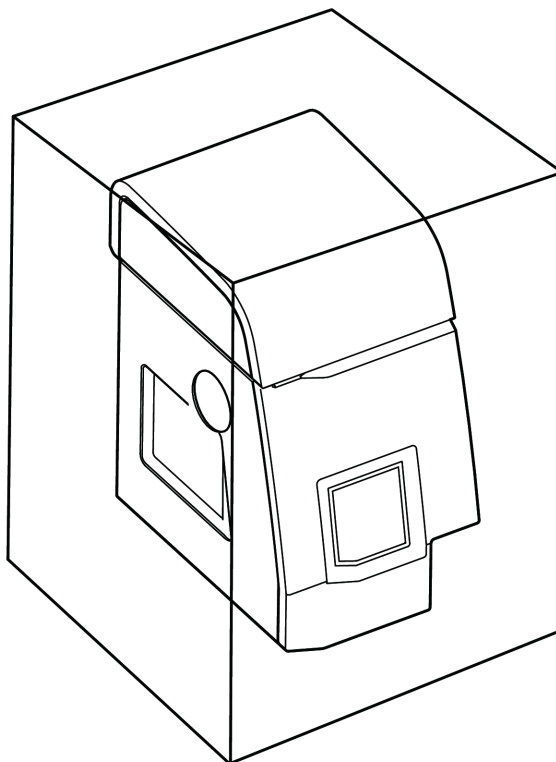
Fig.	Part Name	Part No.	Q'ty	Remarks
-	Clear file	-	1	Includes the inspection results sheet, auto tuning data, and packing list.
-	Instruction manual	-	1	Includes the instruction manual for the triple inlet turbo molecular pump
	OP cover	-	1	
	Rotary pump cable	S225-17224-41	(1)	Only supplied when there is no rotary pump

Fig.	Part Name	Part No.	Q'ty	Remarks
	Cable, PC-MS ASSY	S225-17125-41	1	Connection cable between the LCMS and the PC
	CLAMP, SNK1025	S035-06033-37	(1)	Only supplied when there is no rotary pump
	RP exhaust hose set	-	1	Includes hose clamp
	Vinyl tube R3603 1/2×3/4	S016-31414	1 m	
	SI rubber tube 7×10 NL	S016-31350-19	-	1300 mm
	Rubber plug ASSY	S225-06482-92	1	
	Joint, L1252	S035-61561-11	1	
	Clamp, TS185-08-00-T	-	1	
	Cable tie GT-1401	-	6	
	Teflon™ sleeving 12×18	S018-31510	5 m	

1.4.4 Packed Parts (4)

Part Name	Part No.	Q'ty	Remarks
ESI unit ASSY	225-19550-41	1	



1.5 Optional Parts

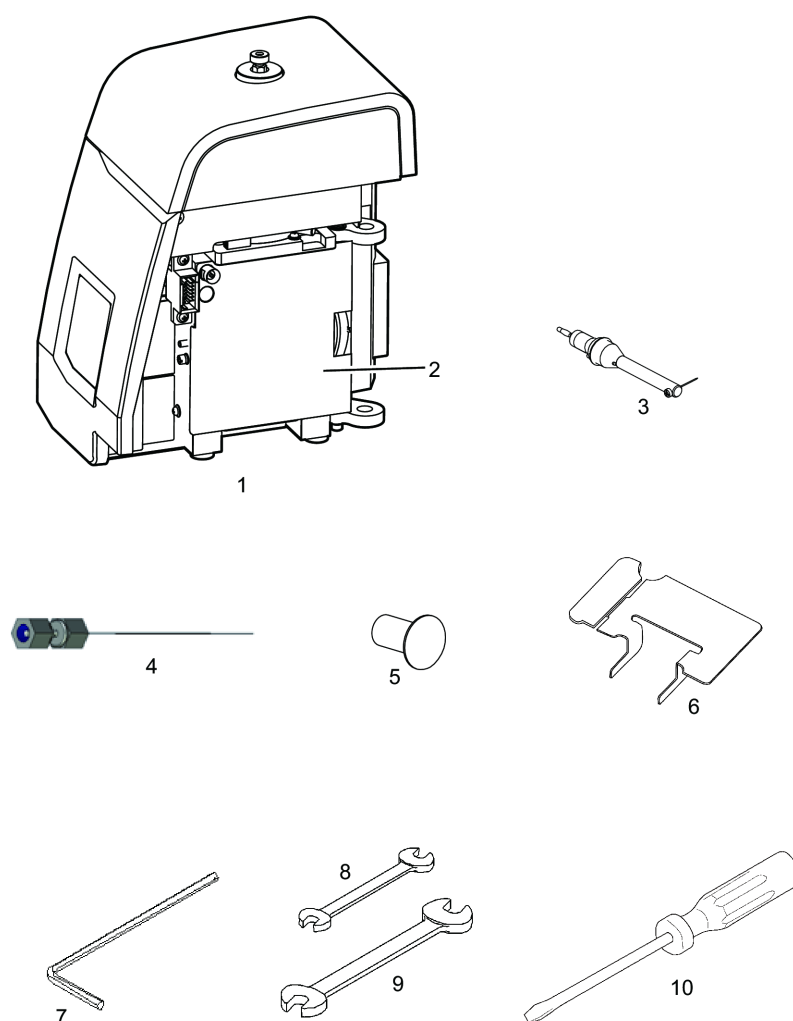
The optional parts for this unit are shown in the table below.

For optional parts that are not listed in the table below and details on optional parts, consult your Shimadzu representative.

Optional Part Name	Part No.	Features
APCI-8050	S225-19601-58	APCI ionization unit and needle unit
DUIS-8050	S225-19605-58	Needle unit capable of simultaneous analysis in both ESI and APCI modes
RP oil return kit	S225-05990-92	Kit that traps the exhaust gas from the rotary pump and returns oil to the rotary pump
Startup kit	S225-13915-45	A kit of recommended accessories such as consumables

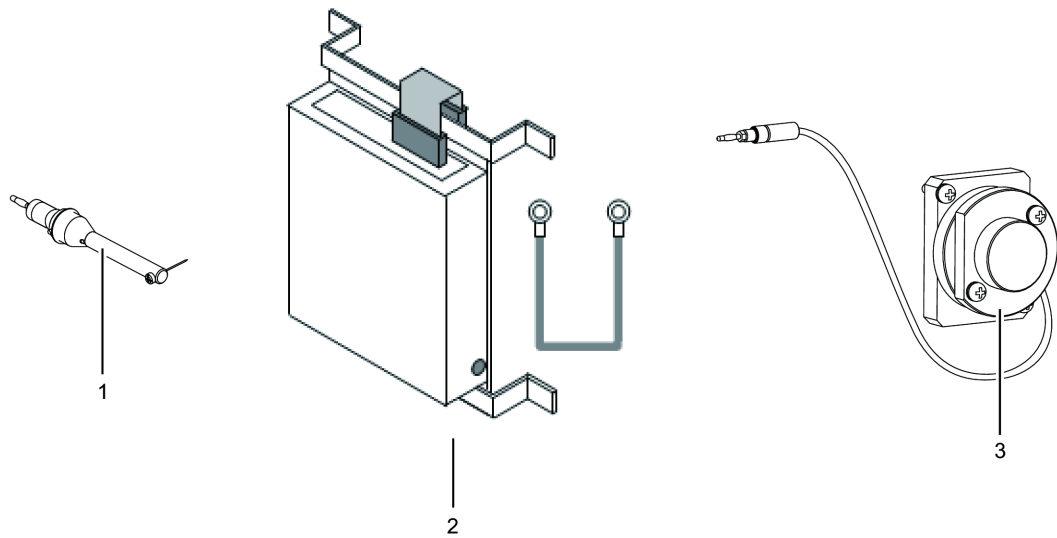
1.5.1 APCI-8050: S225-19601-58

No.	Part Name	Part No.	Q'ty	Remarks
1	APCI unit	-	1	
2	Protective cover	-	1	
3	Needle unit	S225-14290-41	1	
4	APCI pipe ASSY	S228-15845-91	1	
5	Corona needle plug	-	1	High voltage socket blank
6	Needle scale	-	1	Needle alignment tool
7	Hexagon wrench 1.5	-	1	
8	Spanner, double open-end, 7×8	-	1	
9	Spanner, double open-end, 10×14	-	1	
10	Screwdriver, DS-13	-	1	



1.5.2 DUIS-8050: S225-19605-58

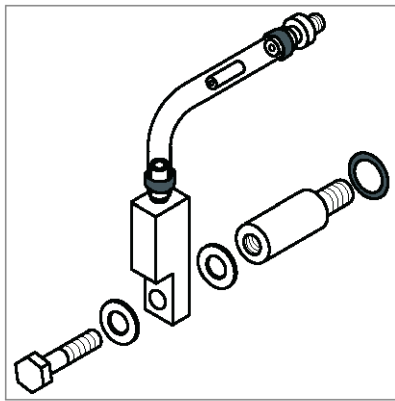
No.	Part Name	Part No.	Q'ty	Remarks
1	Needle unit	S225-14290-41	1	
2	TQ-HV DUAL ASSY (UF)	S225-17101-42	1	High voltage power supply for DUIS
3	Needle socket ASSY	S225-19609-41	1	



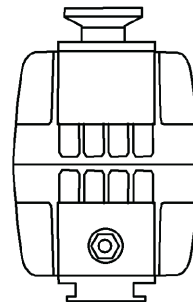
1.5.3 RP Oil Return Kit: S225-05990-92

No.	Part Name	Part No.	Q'ty	Remarks
1	Oil return kit, E2M28	-	1	
2	Oil mist filter, EMF20	S042-00124-33	1	
3	Flange, KF25-#15 straight	-	1	
4	CENTERING RING, SNA7025	S035-06033-18	1	
5	CLAMP, SNK1025	S035-06033-37	1	
6	Hexagon wrench 8	-	1	

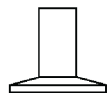
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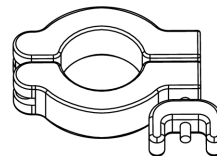
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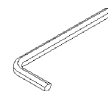
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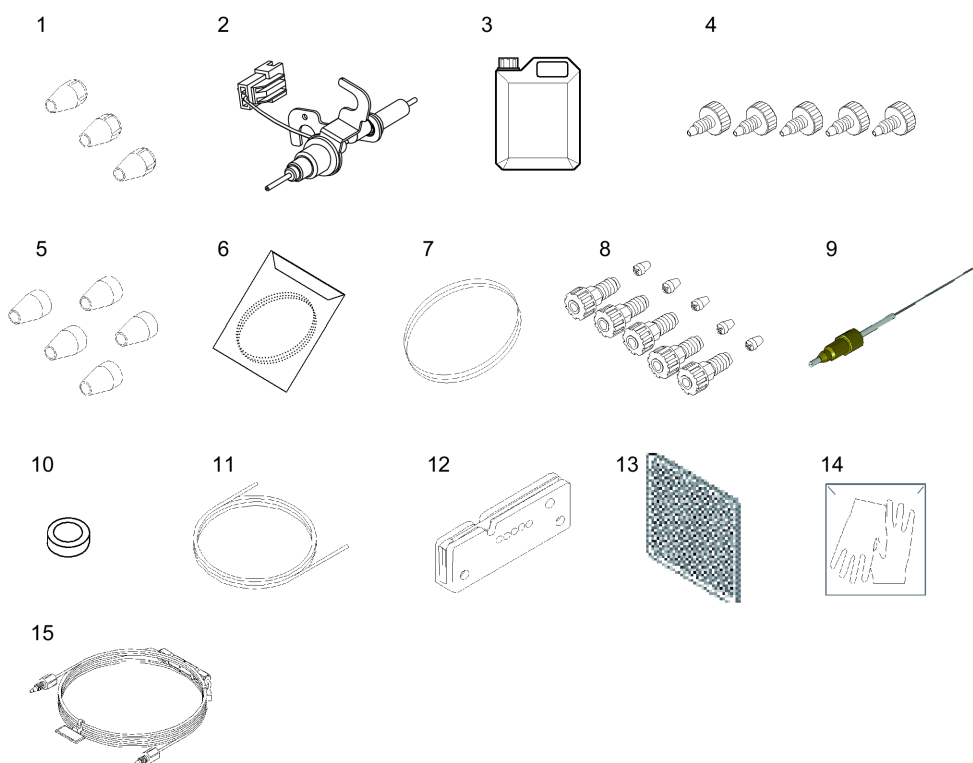


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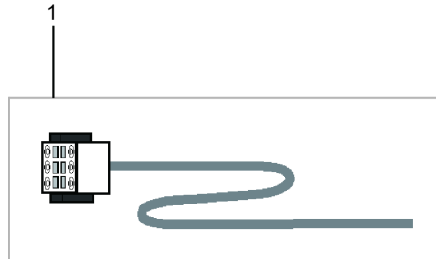
1.5.4 Startup Kit: S225-13915-45

No.	Part Name	Part No.	Q'ty	Remarks
1	Ferrule 1.6FP, total of 3	S228-33513-91	1	PEEK ferrule, total of 3
2	DL ASSY2	S225-15718-42	1	
3	Pump oil, H11025013	S017-30163-02	1	Rotary pump oil, 4 L
4	Male nut, 1.6 MN (total of 5)	S228-18565-84	1	
5	Ferrule 1.6F-T (total of 5)	S228-16007-84	1	PTFE ferrule (total of 5)
6	PEEK tube, ID0.13S	-	1	ID0.13 mm PEEK tube, 3 m
7	PTFE 1.6×0.5	S228-18495-04	1 m	
8	Reflex fitting set	S228-32651-41	1	Nut, ferrule, total of 5
9	ESI pipe ASSY	S225-14948-91	1	
10	SI filter	S228-48607-91	1	Line filter for standard sample bottle
11	0.1 SUS pipe	S228-49120-00	1	ID0.1 mm SUS pipe, 2 m
12	PEEK tube cutter	S228-32930-01	1	
13	Filter	S042-60935-14	1	
14	Gloves, 559-2150 (1 pair)	S086-72599-01	-	
15	Resistance tube, GLP cleaner	S228-32722-94	1	



1.5.5 FCV-20AH Mounting Kit

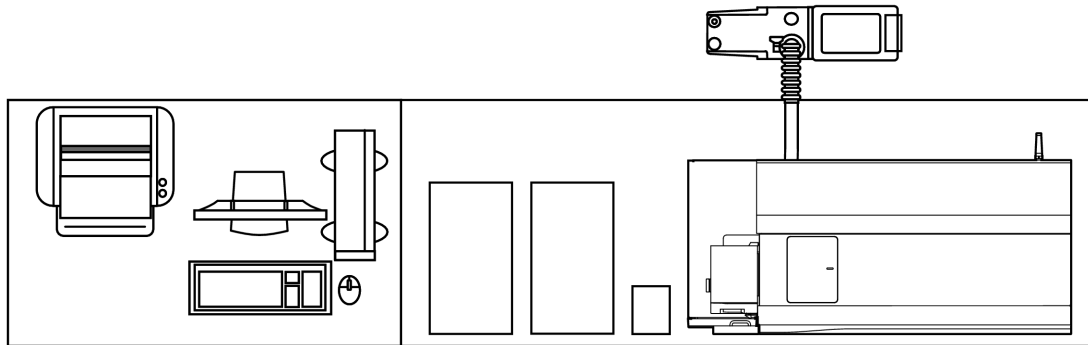
No.	Part Name	Part No.	Q'ty	Remarks
1	CABLE, TQ-FCV	S225-17127-41	1	



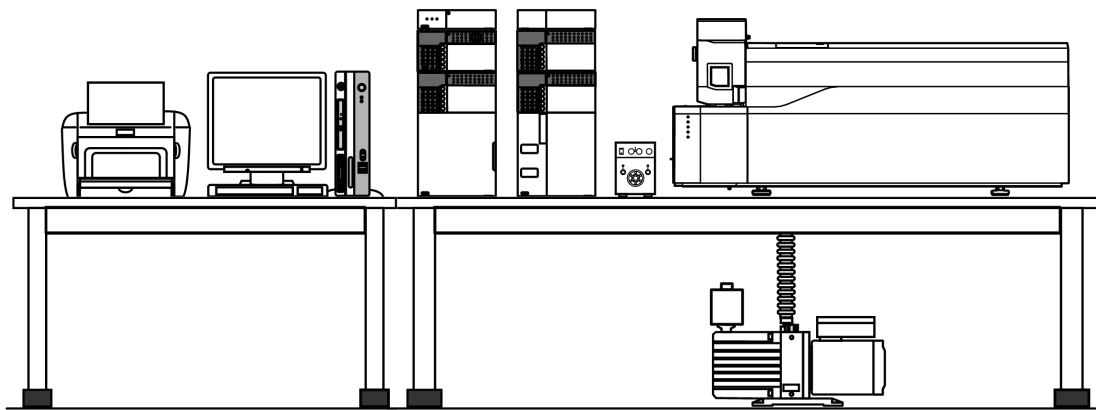
2

Part Nomenclature and Functions

2.1 Arrangement of Component Units

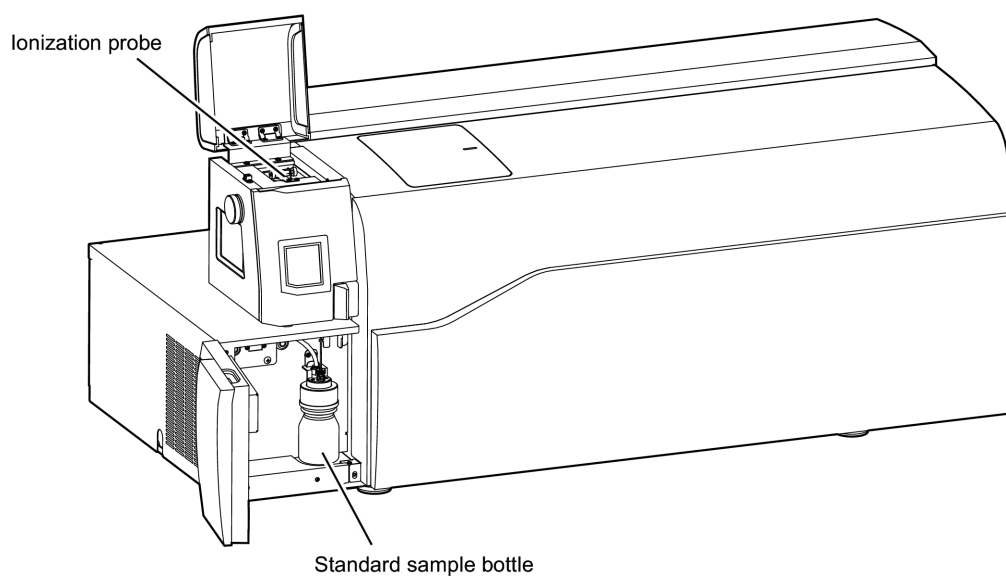
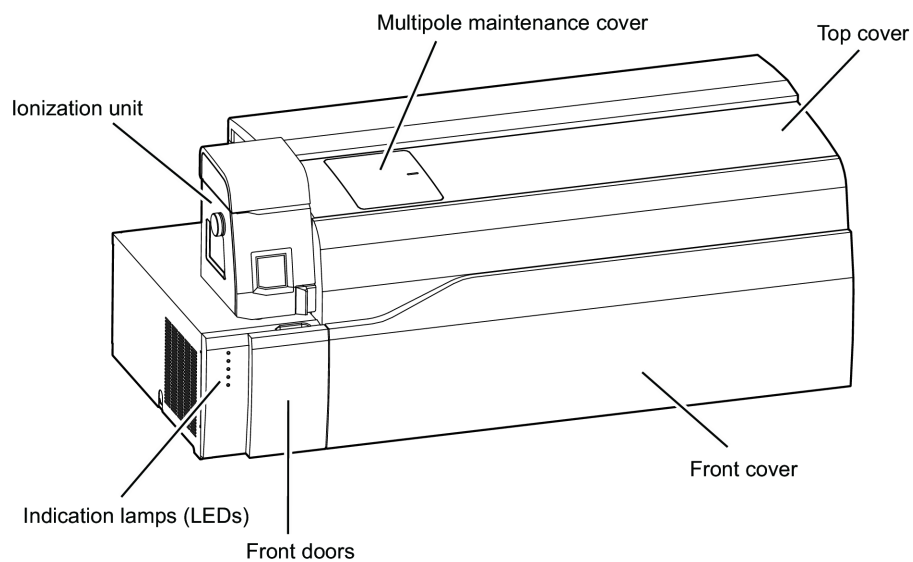


[Plan View]

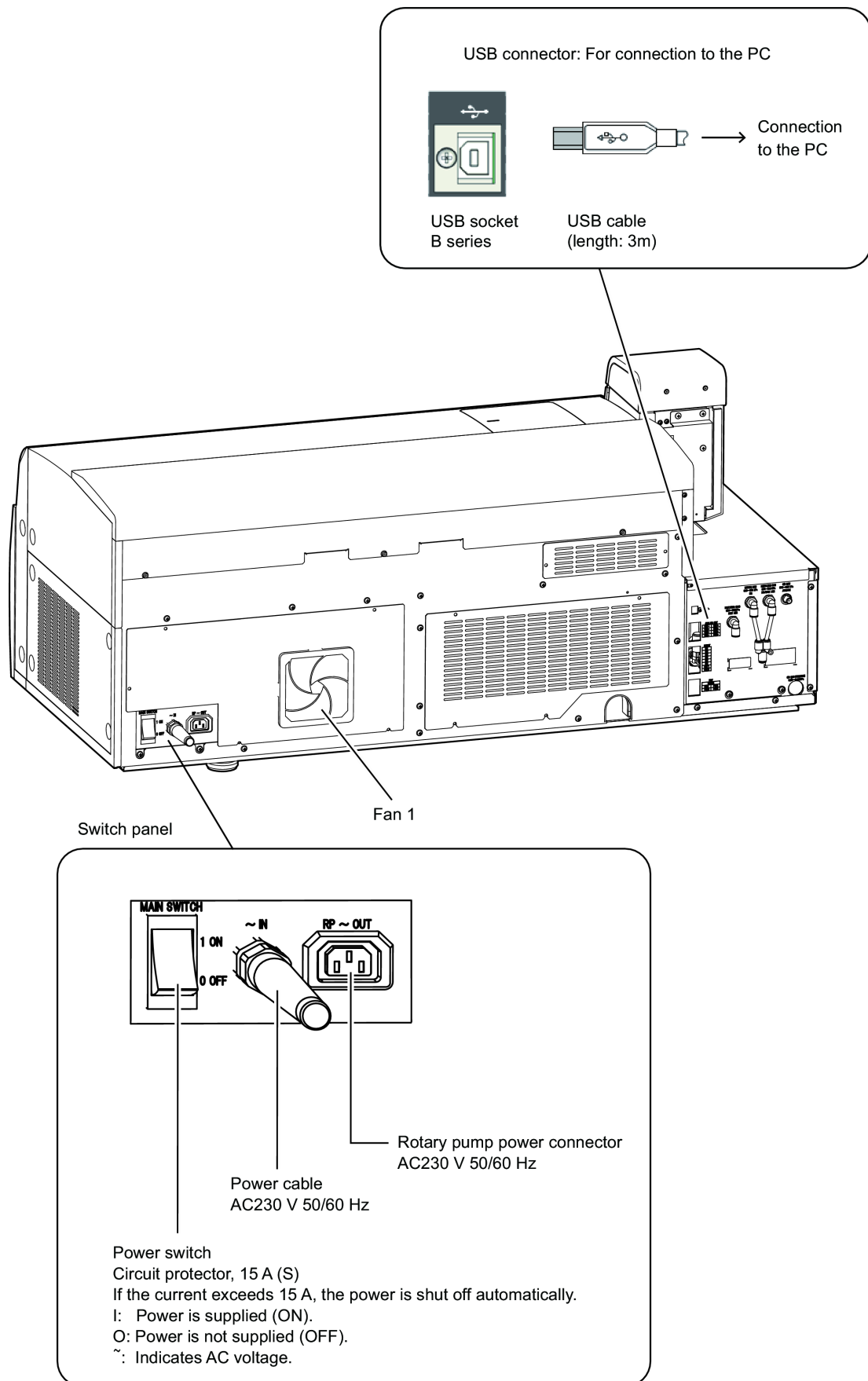


[Front Eleavation]

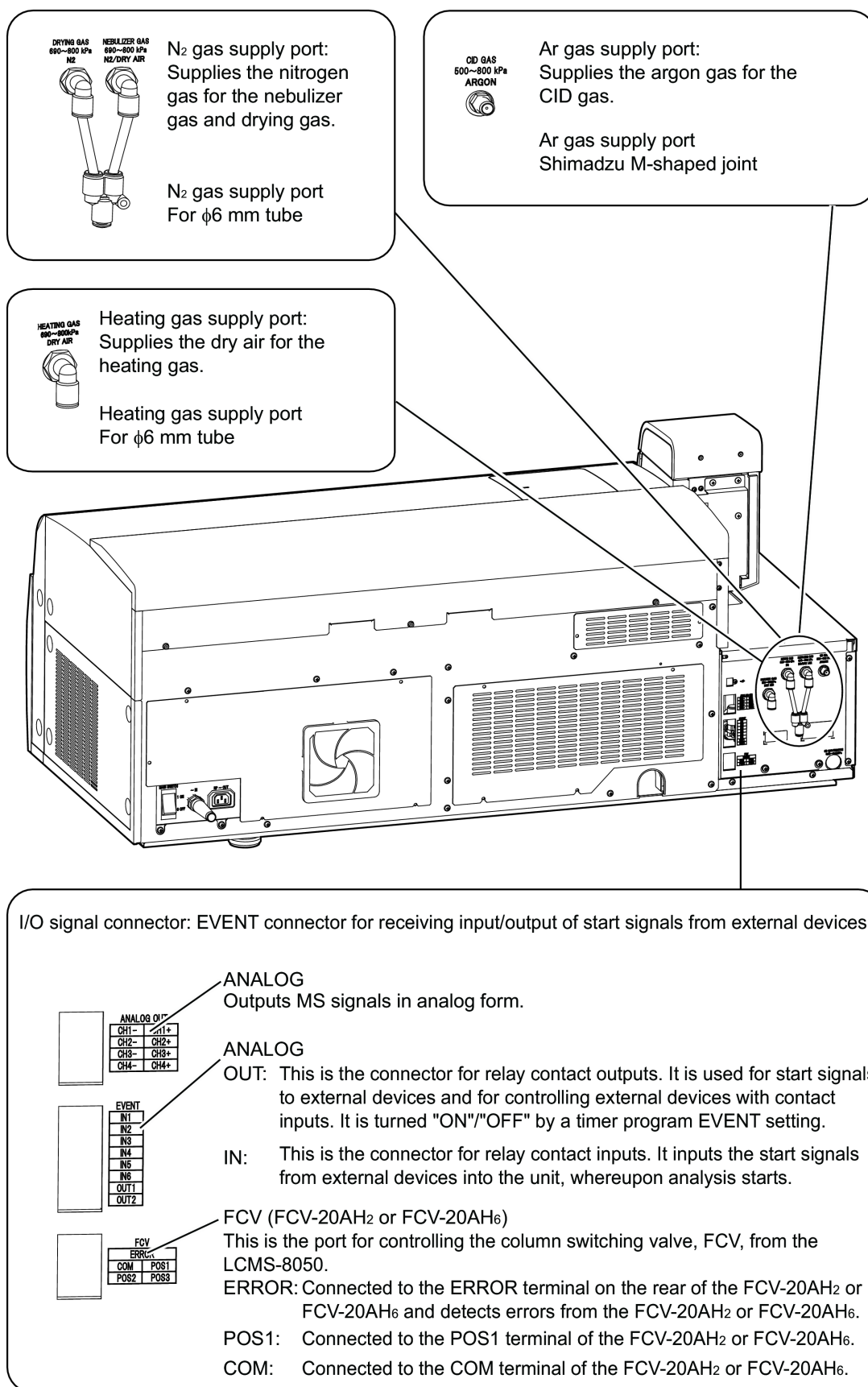
2.2 Names of Parts



Rear View

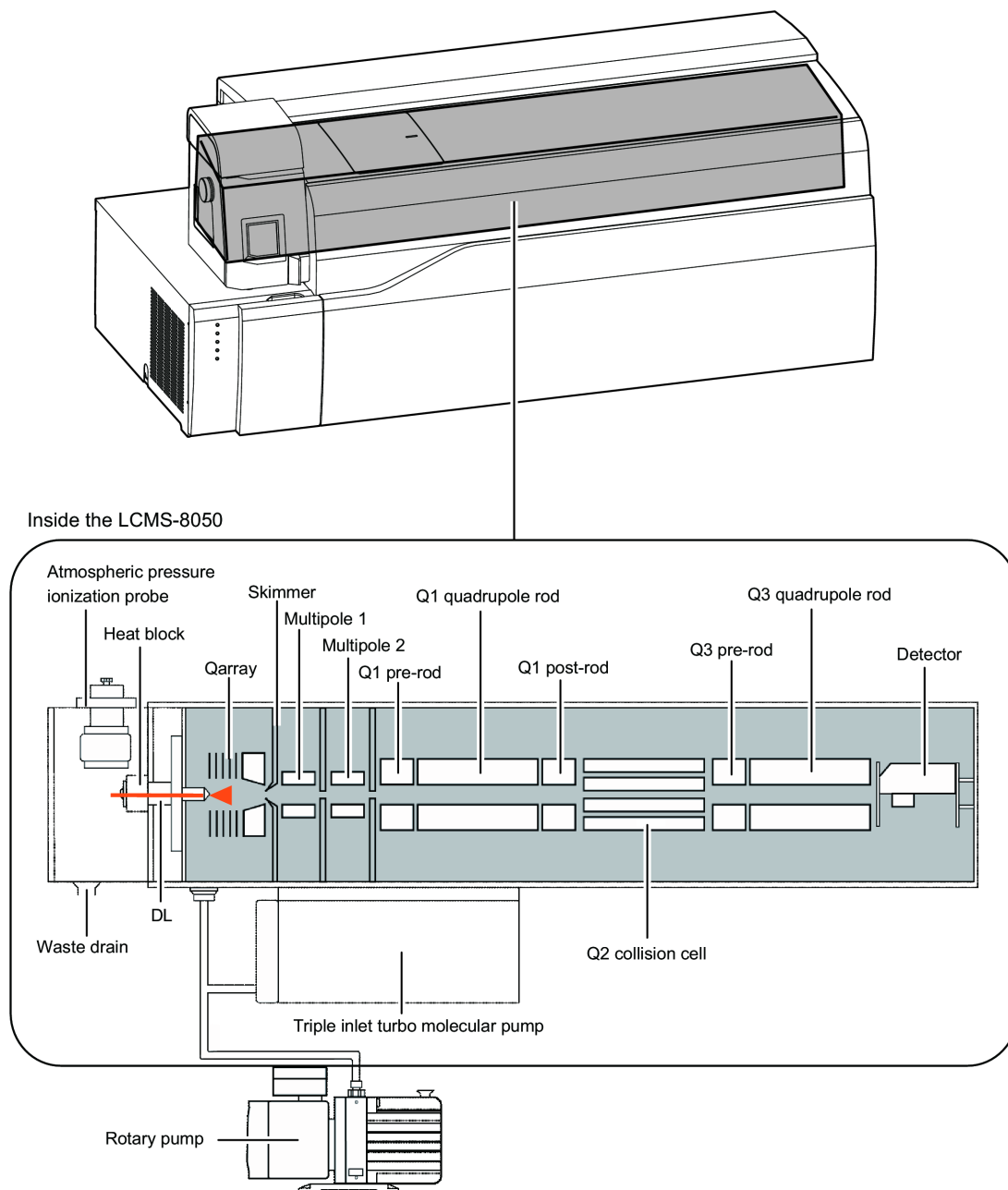


Rear View



2.3 Unit Configuration

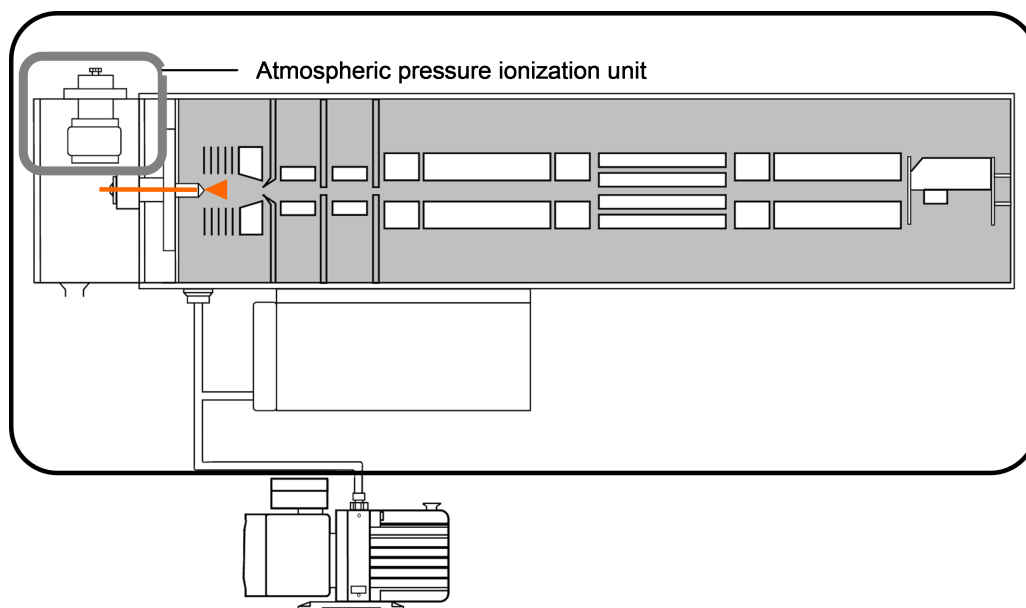
The figure below shows the configuration of the parts in the unit from the loading of the sample to detection. For details on the function of each part, refer to the relevant sections in this manual.



2.4 Atmospheric Pressure Ionization Unit

This is the section that ionizes, under atmospheric pressure, the sample sent from the liquid chromatograph.

The LCMS-8050 features electrospray ionization (ESI) as standard, but by using the optional ionization unit and corona needle it is also possible to use the atmospheric pressure chemical ionization (APCI) method and dual ion source (DUIS) ionization.



2.4.1 Using the ESI Unit

The ESI unit can be used for effective ionization of samples containing compounds with ionicity and high polarization.

■ Principle of ionization

The sample solution is drawn into a capillary tube with a high voltage of around ± 1 to ± 5 kV applied to it.



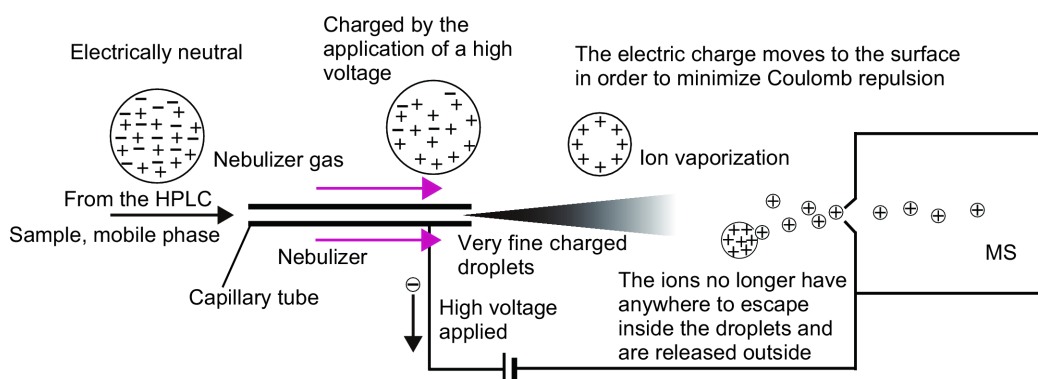
Nebulizer gas is blown out around the outside of the capillary tube, spraying the solution and generating fine droplets that are electrostatically charged with the same sign as the applied voltage.



During the course of movement the charged droplets are subject to vaporization of the solvent, and they disintegrate when the repulsive force among the charges exceeds the surface tension of the liquid.

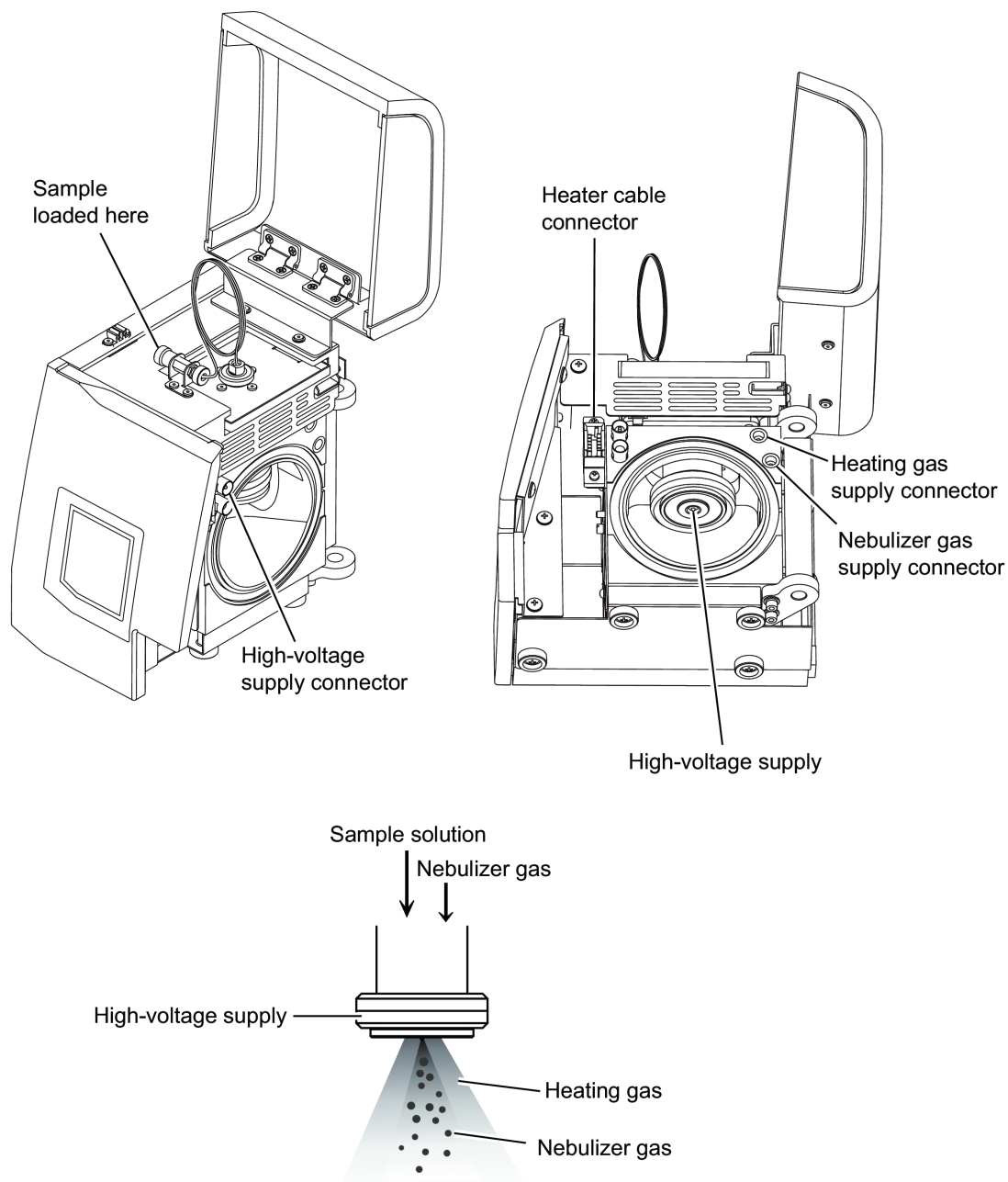


Through repetition of vaporization and disintegration, very fine droplets are achieved, and ultimately it is thought that sample ions are released in the vapor phase. This state is called ion vaporization.



■ ESI unit construction

The figure below shows the component parts of the ESI unit.



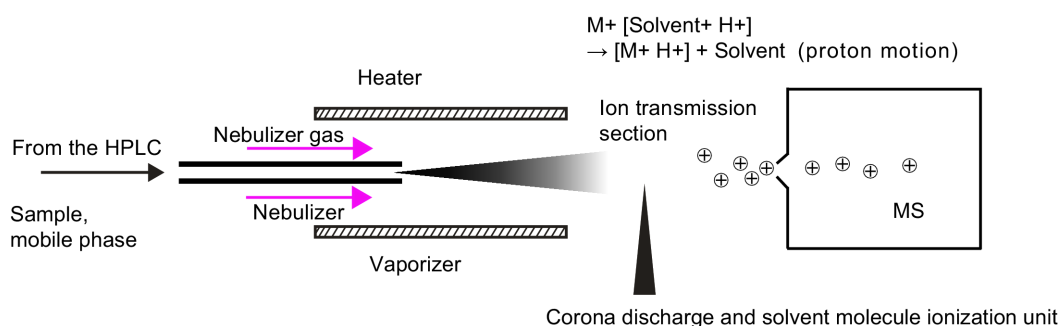
2.4.2 Using the APCI Unit

The APCI unit can be used effectively to ionize compounds with low and medium polarity.

■ Principle of ionization

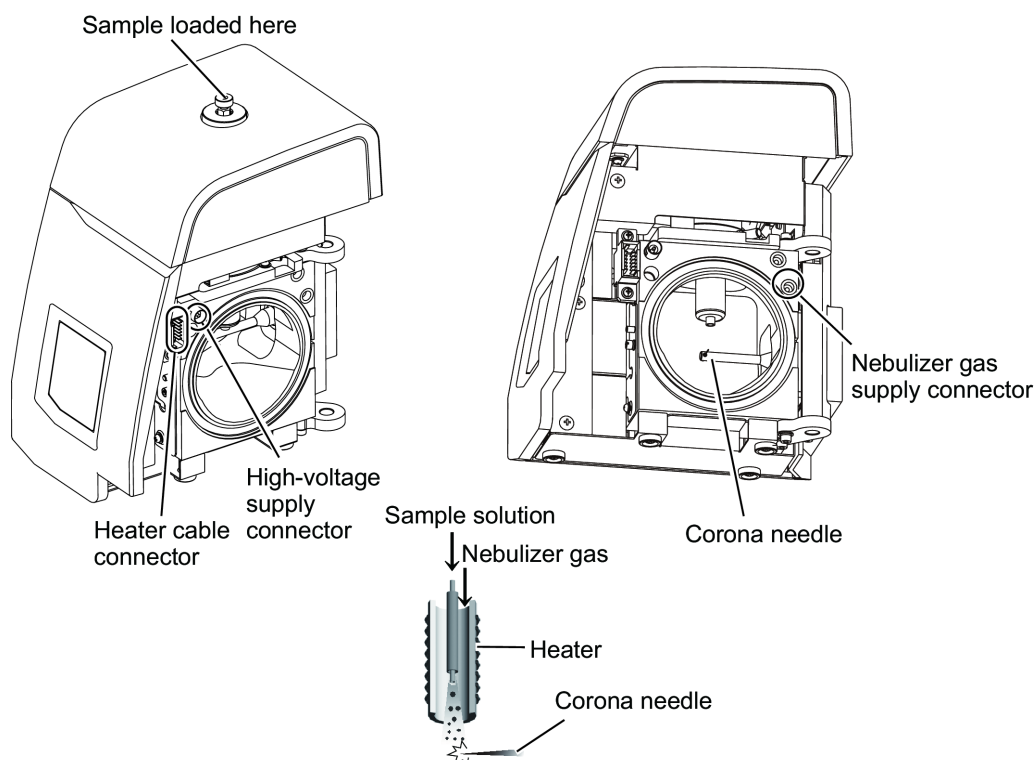
The solvent gas heated (from 100 to 500 °C) inside the APCI unit is ionized on the occurrence of corona discharge due to the application of a high voltage (± 1 to ± 5 kV) to the needle.

The sample molecules are ionized as a result of ion-molecular reactions (CI reactions) with the solvent ions. Nebulizer gas is used to spray the liquid in the same way as with ESI.



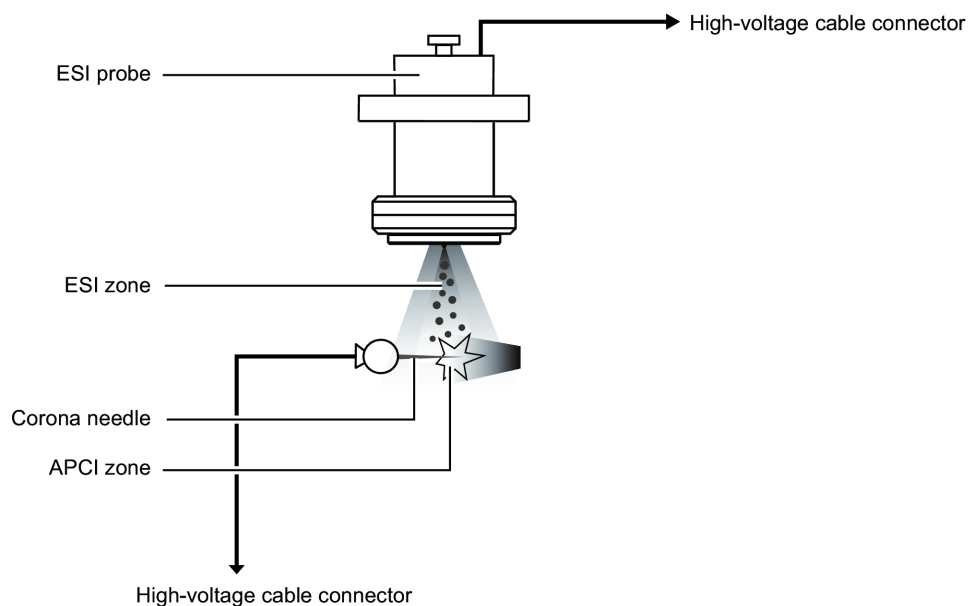
■ APCI unit

The figure below shows the component parts of the APCI unit.

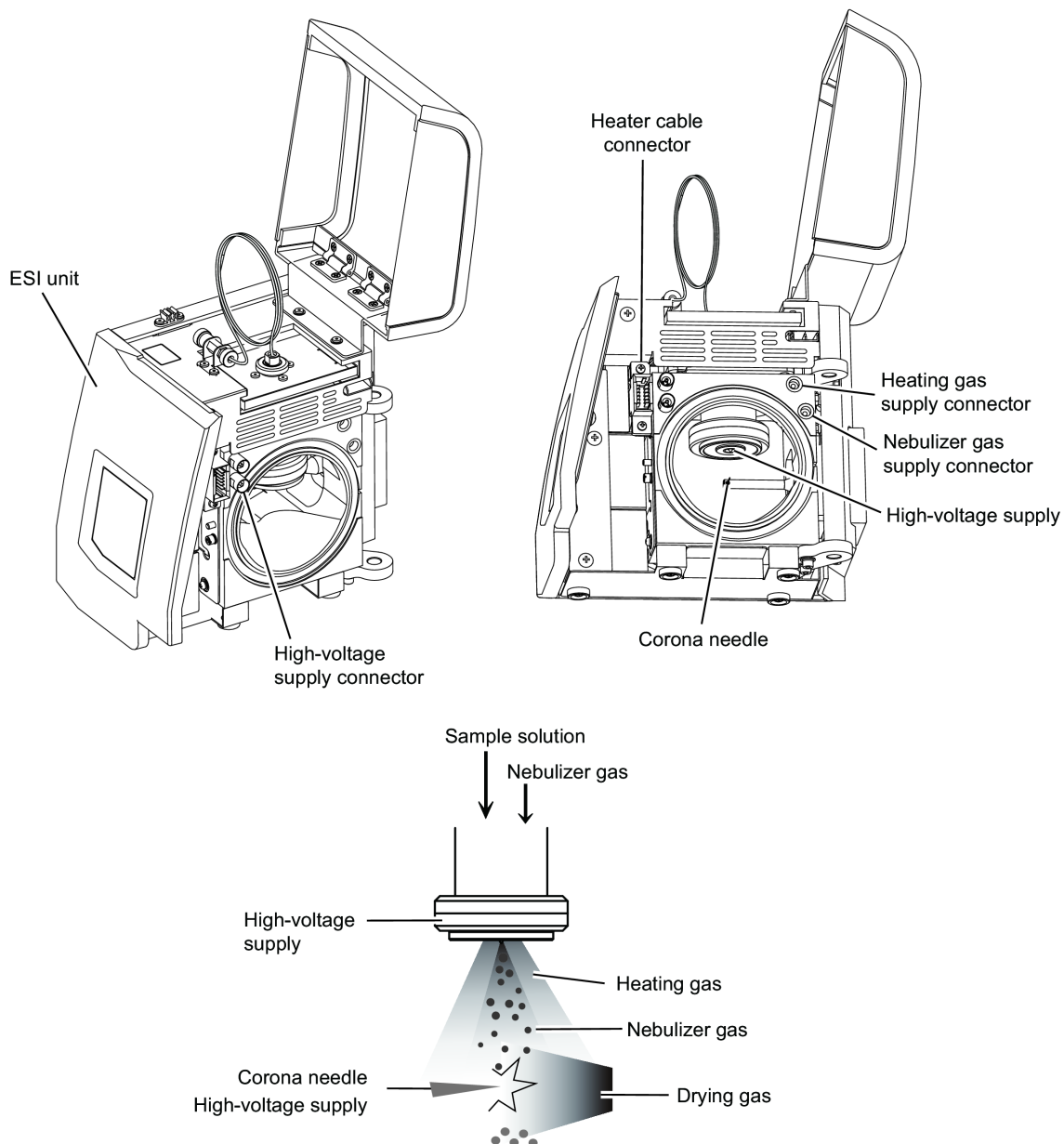


2.4.3 Using DUIS (Dual Ion Source)

This is an ionization method in which data can be obtained in both ESI and APCI modes. High voltages are applied simultaneously to the nebulizer for ESI and the corona needle, and heated dry gas is used to assist ionization in the APCI mode. The ESI unit provided as the standard accessory is used as the nebulizer for ESI.



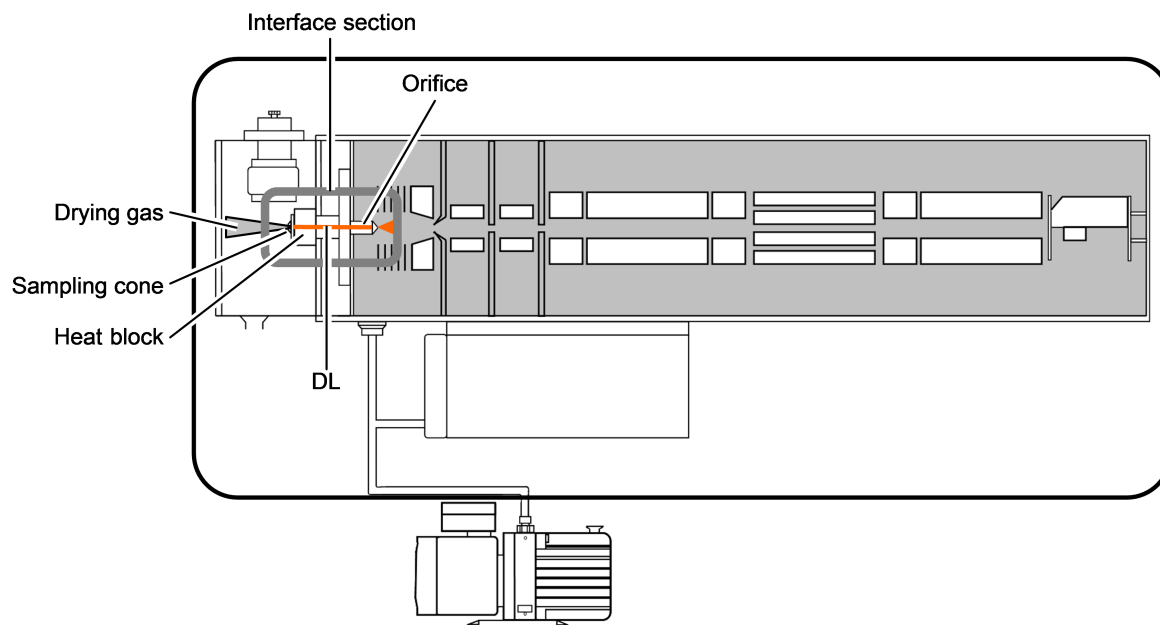
■ ESI unit and corona needle

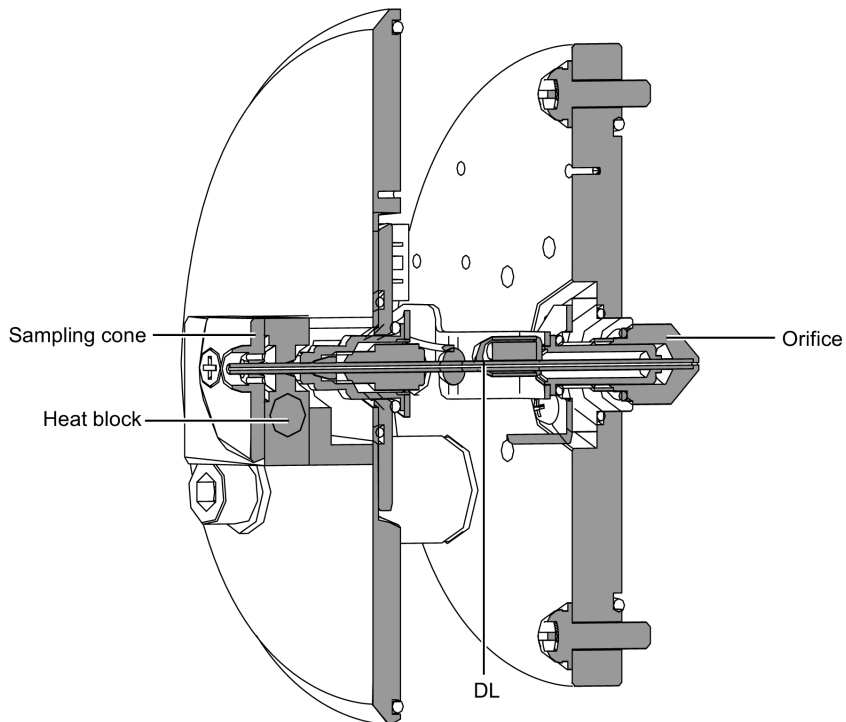
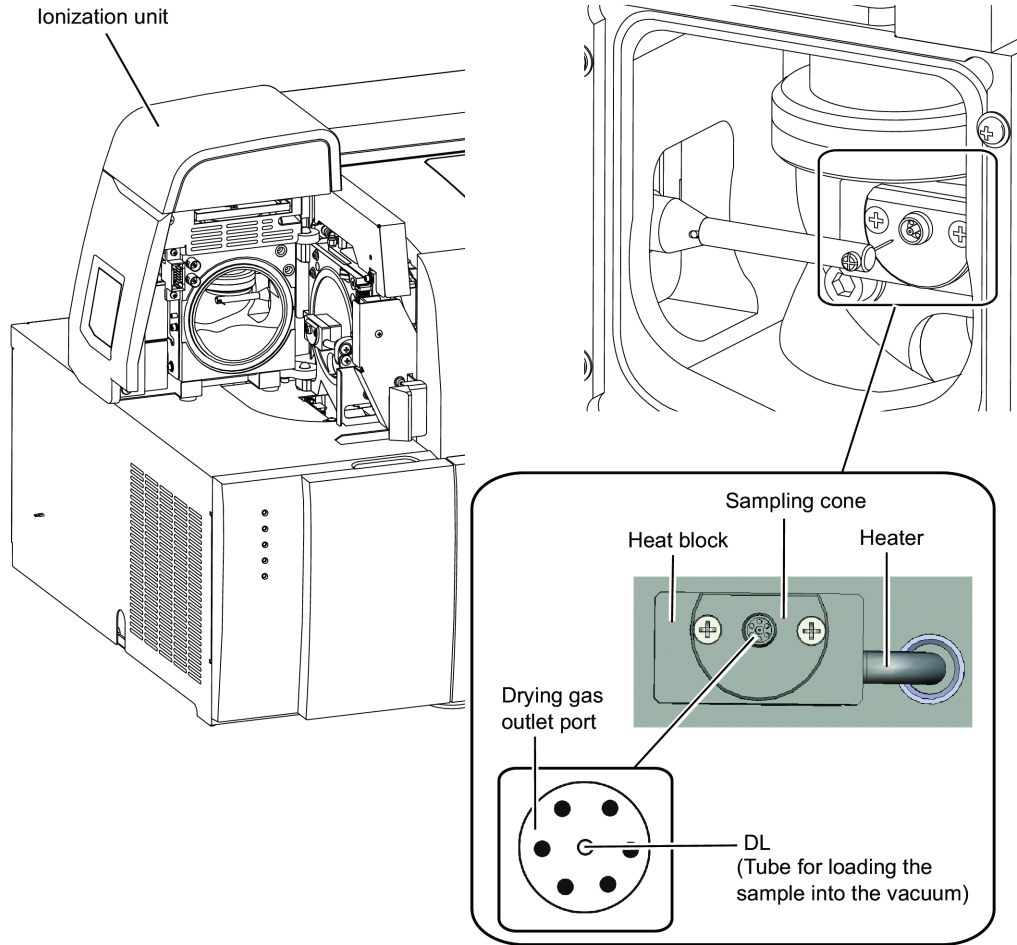


2.5 Interface Section

The interface section introduces the ions generated by the ionization probe unit into a vacuum.

The status of the spray generated under atmospheric pressure can be observed through the source windows at the front and side of the unit.

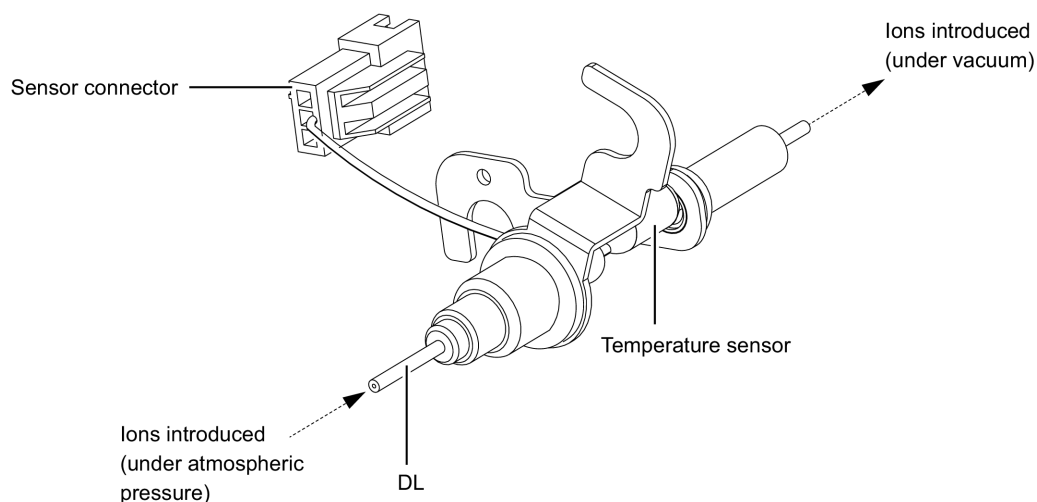




2.5.1 DL (Desolvation Line)

The charged droplets that have been spray ionized under atmospheric pressure are heated by the DL. This heating serves to remove the solvent and introduce ions into the vacuum.

The DL can be changed without stopping the vacuum.

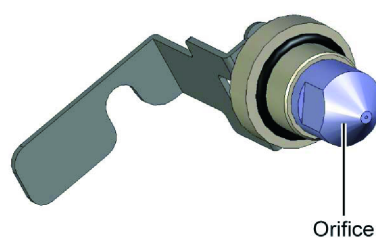


2.5.2 Orifice

The orifice is located at the tip of the DL. The orifice maintains the vacuum and the DL can be changed without stopping the vacuum.

NOTE Stop the vacuum before removing the orifice.

Orifice ASSY



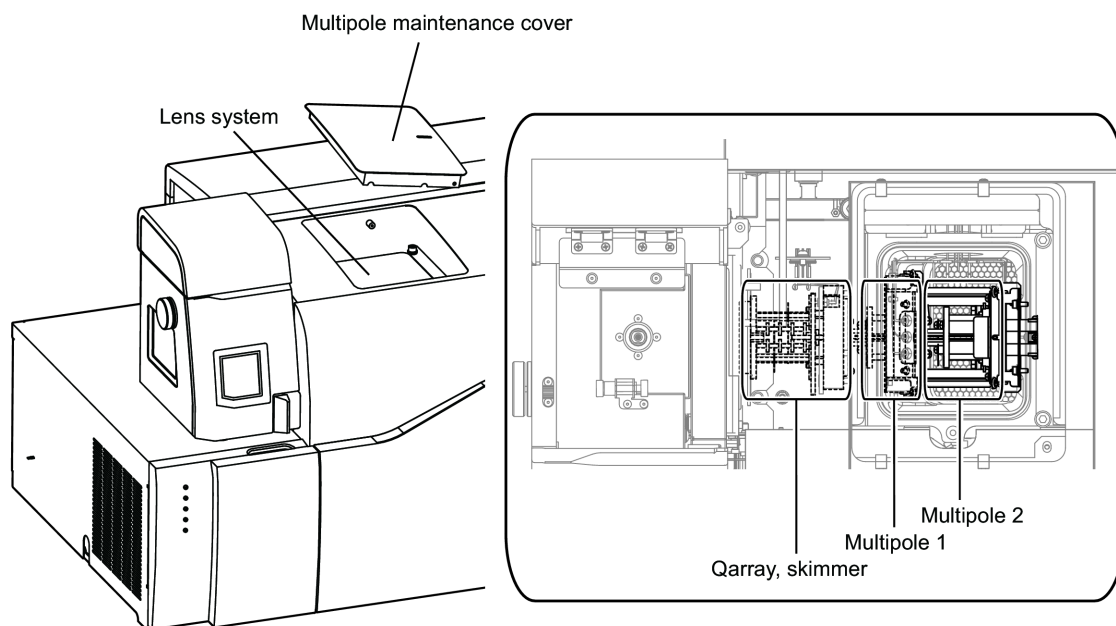
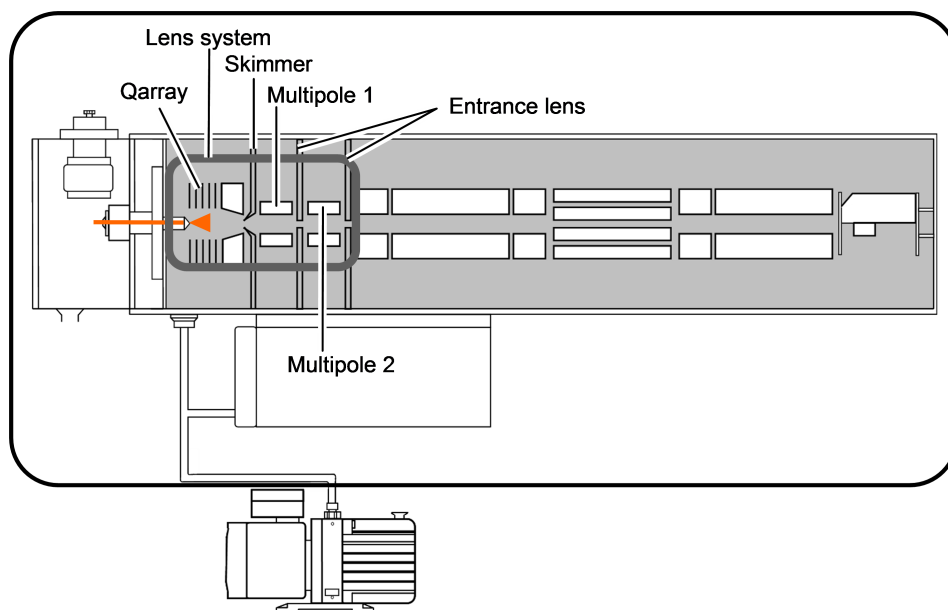
2.6 Lens System

The ions generated under atmospheric pressure are efficiently focused, and then introduced into the quadrupole rods by the lens system.

The lens system comprises the Qarray, skimmer, multipole, and entrance lens.

Each part can be removed by opening the instrument's top cover and the lens system door.

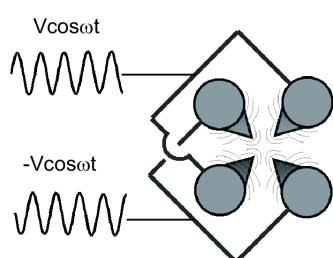
NOTE Stop the vacuum before handling the parts of the lens system.



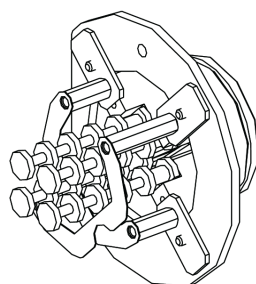
2.6.1 Qarray, Skimmer

The Qarray and skimmer located inside the first stage vacuum chamber focus the scattering of the ions emitted from the DL. The Qarray arranges the quadrupole electric field as a number of stages which progressively focus the ions in their direction of progress, and this constriction makes the ions converge efficiently on the hole in the tip of the skimmer. The same high-frequency voltage is supplied to opposing electrodes, while adjacent electrodes are supplied with high frequency voltages with a phase difference of 180 degrees. The high frequency voltage acts as a force to confine the ions and because, in contrast to a quadrupole mass filter for mass separation, DC voltage is not used, it functions as an ion guide.

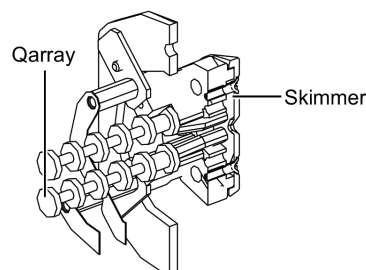
The skimmer is a partition that separates the first vacuum chamber and the second vacuum chamber.



V: High frequency voltage
 ω : Angular frequency



External view of the Qarray and skimmer



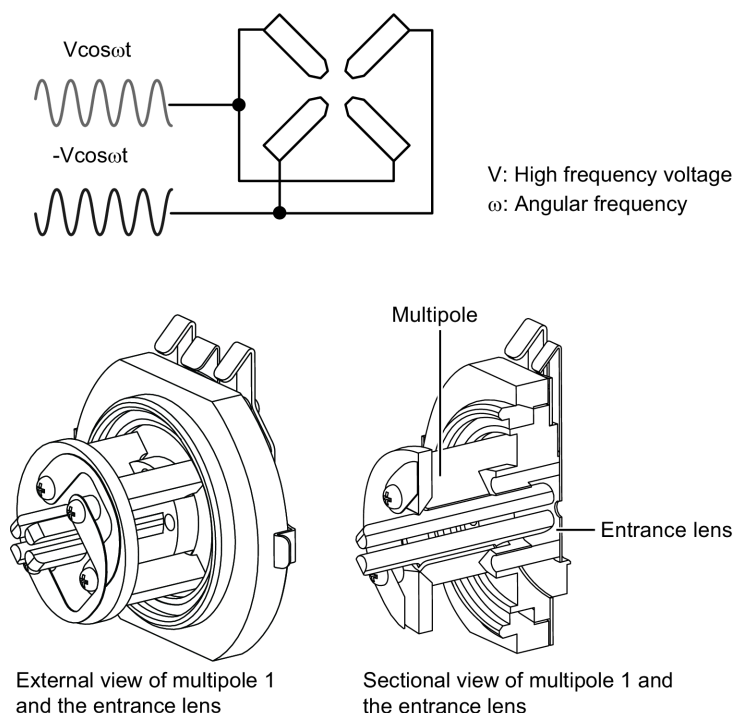
Sectional view of the Qarray and skimmer

2.6.2 Multipole, Entrance Lens

These are lens components that lead the ions that emerge from the skimmer into the quadrupole rods.

Multipole 1 and multipole 2 are located in the second and third vacuum chambers, respectively.

The multipole is a high-frequency ion guide that is located at the rear of the skimmer. A radio-frequency voltage is applied to the electrodes to confine and focus the ions. Adjacent electrodes are supplied with high-frequency voltages with a phase difference of 180 degrees. Like the Qarray, it functions as an ion guide that does not use DC voltage. The entrance lens comprises the second and third partitions.



CAUTION

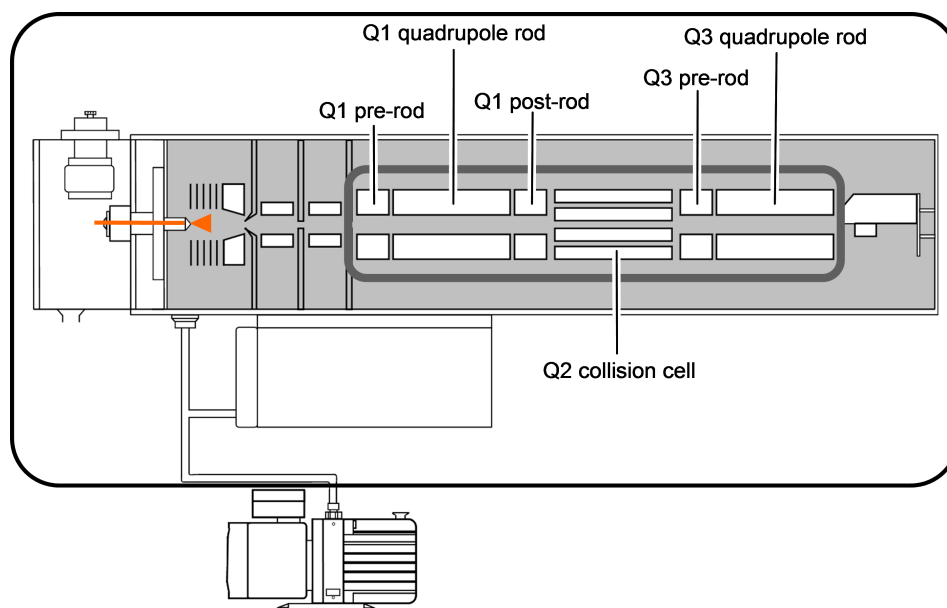


Prohibition

Do NOT disassemble the assembly components of the Qarray, multipoles and so on.

This may cause injury or damage the instrument.

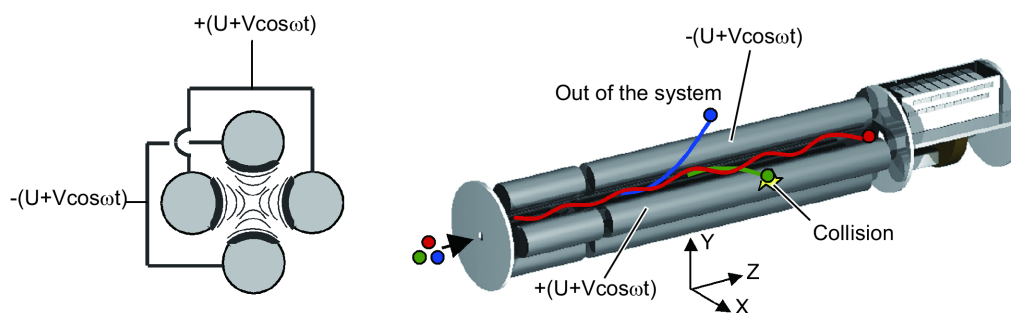
2.7 Analysis Unit



The analysis unit is composed of four precision machined hyperbolic electrodes and pre-rods, and the four electrodes are arranged an equal distance from, and parallel to, the center axis.

The ions generated in the ionization unit are accelerated in the Z-axis direction by a relatively weak voltage of several volts and introduced into the quadrupole zone through a small hole. Within the quadrupole, voltages of the same polarity are applied to opposing electrodes, while voltages with positive and negative reversed are applied to adjacent electrodes. When both DC voltage U and high-frequency AC voltage $V \cos \omega t$ (ω : high angular frequency, t : time) are applied to each of the electrodes, an electric field that changes phase at high speed is generated within the quadrupole.

This electric field causes the ions that pass through it to oscillate in the X and Y axis directions. If specific conditions (U , V , ω) are imposed at this time, ions within a particular range of mass-to-charge ratios (m/z) go into the "stable oscillation" state and can pass through the quadrupole and reach the detector. Ions with m/z ratios outside this range oscillate unstably and collide with the electrodes or fly out of the system, and so are not detected.

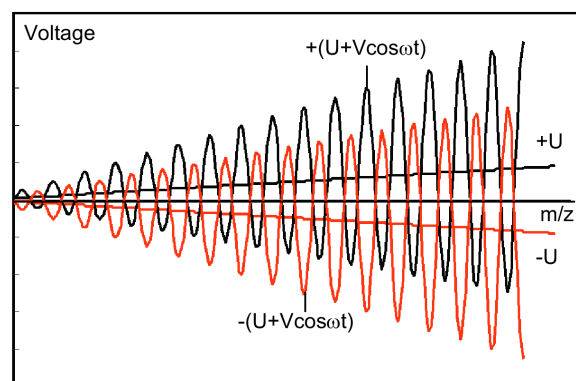
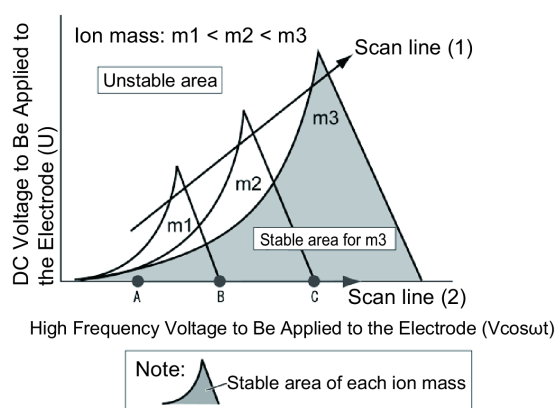


Side View of a Quadrupole Type Mass Spectrometer

It is known that the vibration of ions inside the quadrupole follows an equation called Mathieu's equation. The ions move so that they satisfy equation (1) below regardless of their initial speed or initial position.

$$\frac{m}{z} = K \frac{V}{r^2 \omega^2} \quad \dots (1) \quad \begin{array}{l} K : \text{constant} \\ r : \text{distance between electrodes} \end{array}$$

The conditions under which the ions vibrate stably are expressed by the areas bounded by the lines of m_1 , m_2 and m_3 in the figure below when the masses of the ions, m , and their angular frequencies, ω , have been determined. There are different stable areas for the ions with masses m_1 , m_2 , and m_3 . If we vary the voltage while maintaining a constant ratio between the direct current voltage and the high frequency alternating current voltage so that it passes through each of the stable areas for m_1 , m_2 and m_3 , this will mean that ions in the area above the scan line (1) will pass through. This means that we can pass the ions m_1 , m_2 , and m_3 through in order. In this way, we can obtain a mass spectrum for ions with low masses through to ions with high masses.

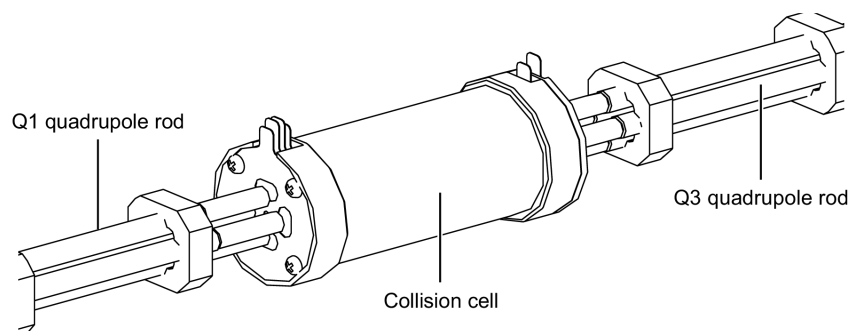
Relationship Between U and V Voltages and m/z

CAUTION



Prohibition

The quadrupole rods are assembled with precision and should not be touched.



2

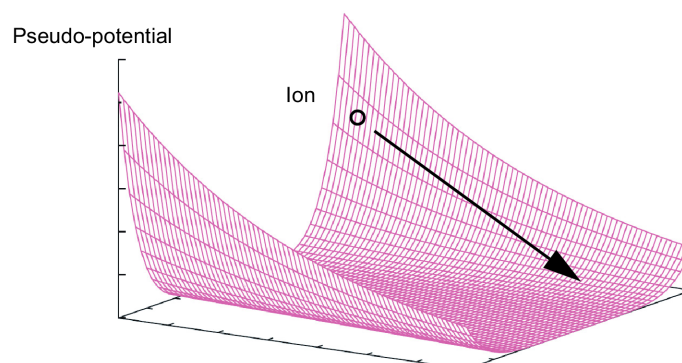
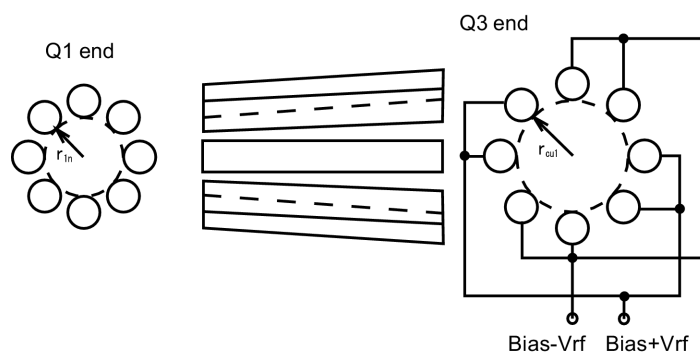
The collision cell is a high frequency ion guide that is located between the Q1 and Q3 quadrupole rods. In the same manner as the high frequency ion guide in the lens system, ions are confined through the application of a high frequency voltage with a phase difference of 180° to the adjacent electrodes.

The pseudo-potential can be expressed by the following equation through the high frequency voltage in the high frequency ion guide.

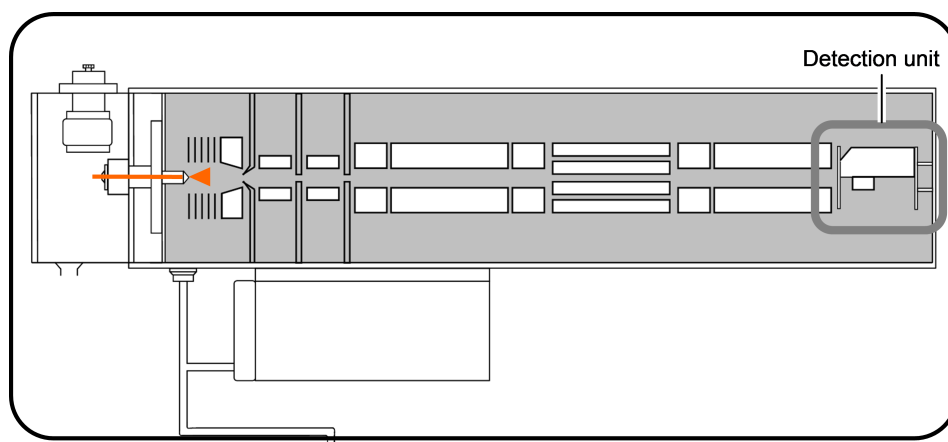
$$V^*(R_0) = \frac{qn^2}{4m\Omega^2} \left(\frac{V_0}{\gamma_0} \right)^2 \left(\frac{R_0}{\gamma_0} \right)^{2(n-1)}$$

γ_0 : radius of the incircle of the high frequency ion guide
 V_0 : high frequency voltage
 n : number of electrodes in the ion guide

The γ_0 value for the Shimadzu collision cell becomes larger closer to the detector. Such a construction sets up a pseudo-potential gradient that accelerates ions. This enables the high speed transfer of ions and makes high speed analysis possible.



2.8 Detection Unit



2.8.1 Detector

The detector comprises the conversion dynode and the electron multiplier (secondary electron multiplier), and it detects positive and negative ions that have passed through the quadrupole rods.

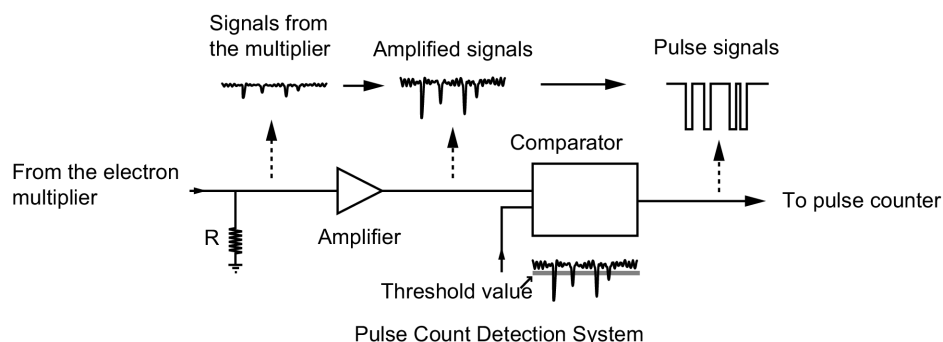
The ions that pass through the quadrupole rods are accelerated by the conversion dynode, to which a voltage of 10 kV is applied, and they collide with the conversion dynode electrode. The collision of these ions releases ions and secondary electrons, which are further accelerated toward the electron multiplier.

The electron multiplier comprises electrodes arranged in a number of stages: the secondary electrons are progressively amplified here and the amplified current is detected at the final stage.

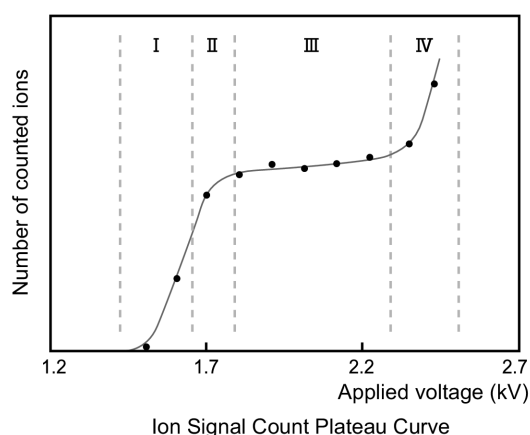
The voltage that is applied to the electrode at each stage is set as the detector voltage, and this voltage value contributes to the amplification factor.

The secondary electrons are detected by the electron multiplier, amplified, and then sent to the pulse count detection system.

The pulse count detection system converts signals that exceed a threshold value into pulses and counts these pulses. Setting the threshold value above the electrical noise level eliminates electrical noise and allows counting of ion signals only.

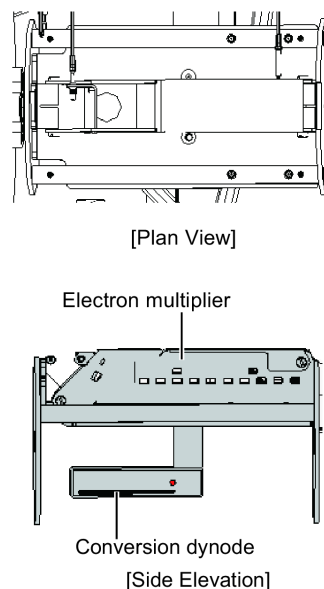
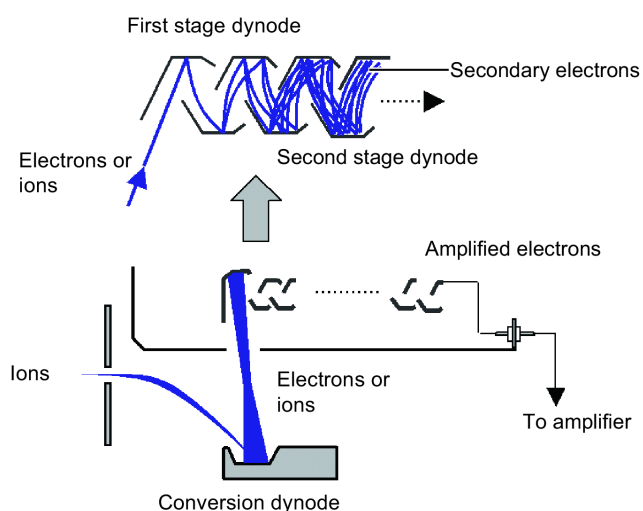


The relationship between the voltage applied to the electron multiplier and the number of counted ions is shown in the figure below. Ion signals can be counted accurately if the detector is operated in the plateau region of the graph.



Region I : Start region
 II : Knee region
 III : Plateau region
 IV : Multi-pulse region

Hint The LCMS-8050 measures the number of ions in the plateau region of the graph above, which means the signal intensity stays about the same even if the detector voltage is changed. If changing the detector voltage by 0.05 kV changes the signal intensity by more than 30 %, the detector may have deteriorated. Try performing auto tuning first to fix the variation.



2.9 Vacuum System

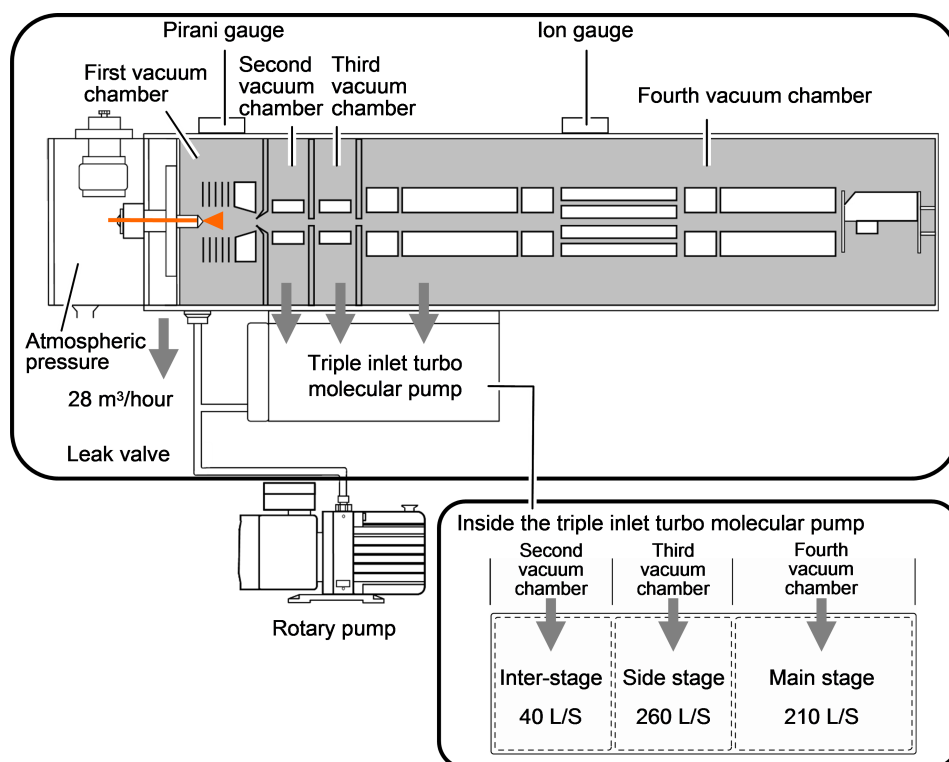
The vacuum housing comprises the atmospheric pressure chamber and the first, second, third, and fourth vacuum chambers. The rotary pump evacuates the first vacuum chamber and the rear part of the triple inlet turbo molecular pump, while a single triple inlet turbo molecular pump evacuates the second, third, and fourth vacuum chambers.

Both of the vacuum pumps are started and stopped by the LabSolutions software.

The pressure is measured by the Pirani gauge fitted to the first vacuum chamber and the ion gauge fitted to the fourth vacuum chamber.

The approximate pressures during measurement are listed below. The analysis detection section is maintained at a high vacuum.

- First vacuum chamber (Q-array section): 100 to 300 Pa
(when the DL temperature is 250 °C)
- Second vacuum chamber (multipole 1 section): Approx. 5 Pa
(no vacuum gauge connected)
- Third vacuum chamber (multipole 2 section): Approx. 0.1 Pa
(no vacuum gauge connected)
- Fourth vacuum chamber (analysis detection unit): 6×10^{-3} Pa
(when CID gas is introduced)



2.10 Standard Sample Introduction Unit

The standard sample is delivered to the ESI unit for sensitivity adjustment, resolution adjustment and mass calibration (auto tuning) of the instrument.

To deliver the standard sample, the standard sample bottle is pressurized with nitrogen gas.

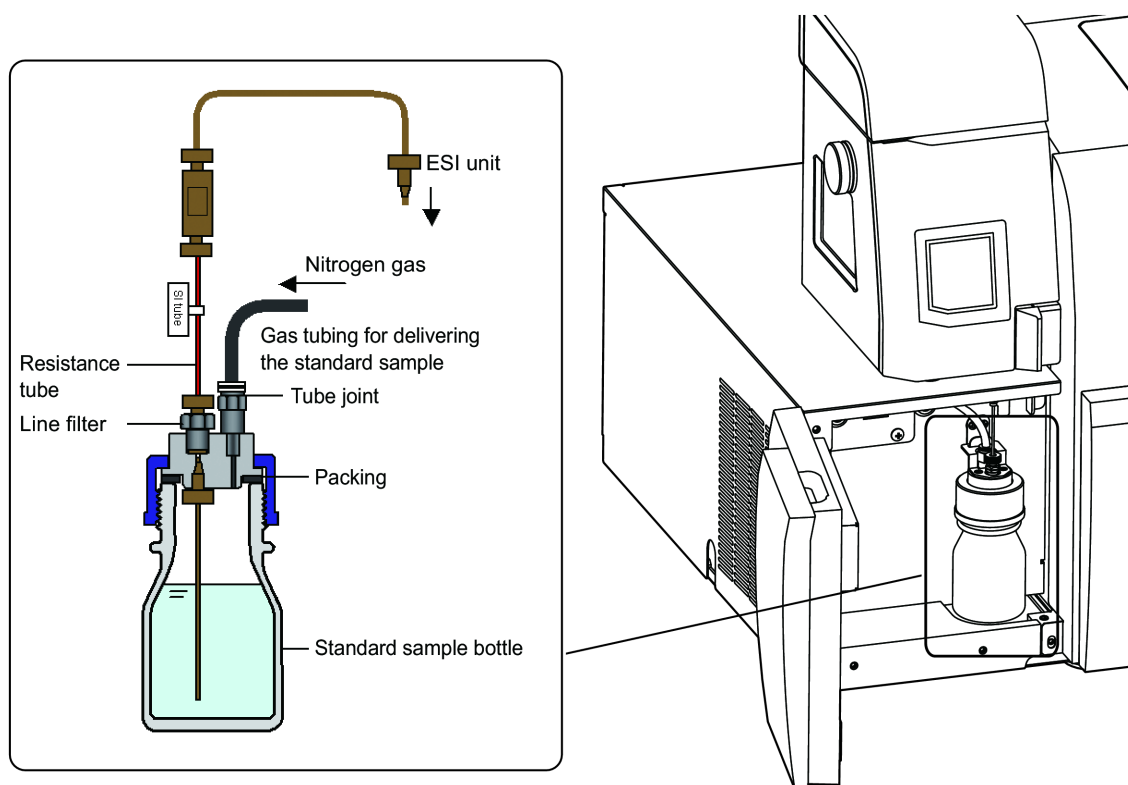
In order to pressurize the standard sample bottle to a constant pressure, tubing is connected by branching from the drying gas flow line.

Sample delivery is performed automatically when using auto tuning, but is started and stopped with the LabSolutions software when using manual tuning.

Since pressurization with nitrogen gas is carried out with the standard sample bottle sealed up, if the sample is delivered over a long period of time you may see a decrease in the flow rate caused by a drop in pressure. In this case, deliver the standard sample again.

You can keep delivering the sample for about 30 minutes with no decrease in the flow rate.

NOTE The sample will not flow out for approximately one minute while the sample tubing becomes filled with the sample.

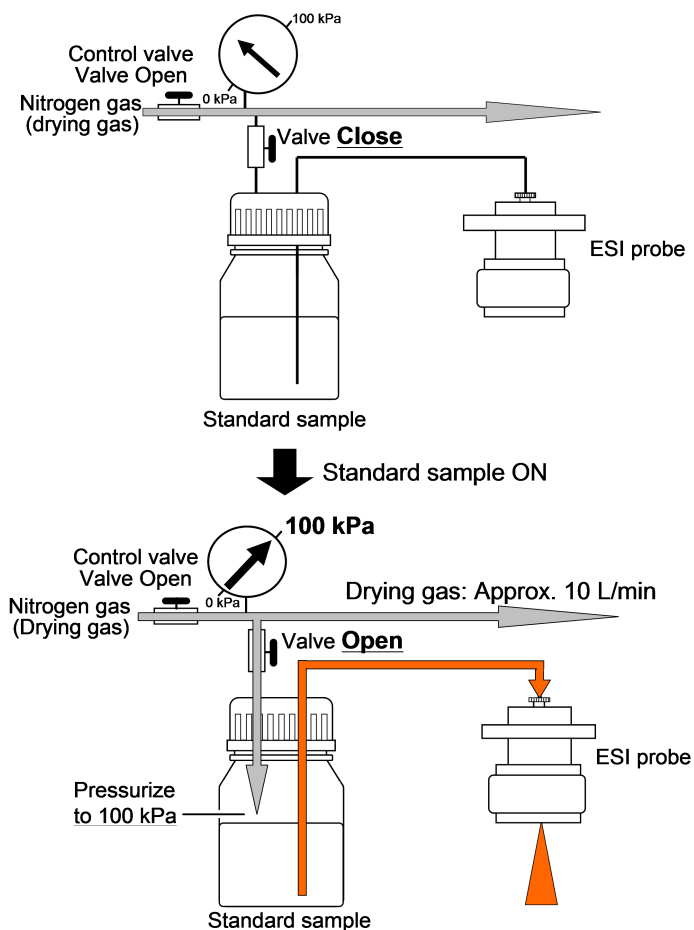


■ Operation of the standard sample introduction unit

When the standard sample is ON:

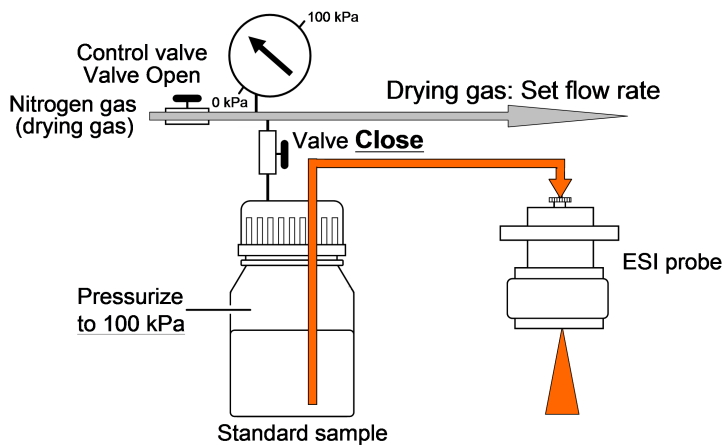
1

Pressurize the inside of the standard sample bottle to 100 kPa.



2

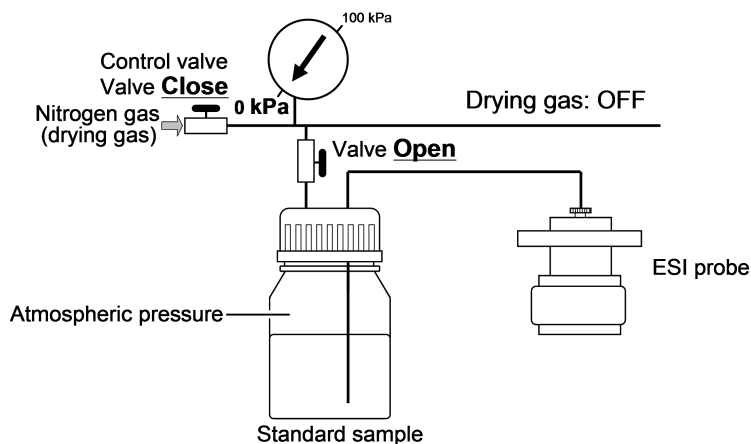
After 10 seconds, close the valve to the standard sample and control the drying gas to the set flow rate.



When the standard sample is OFF:

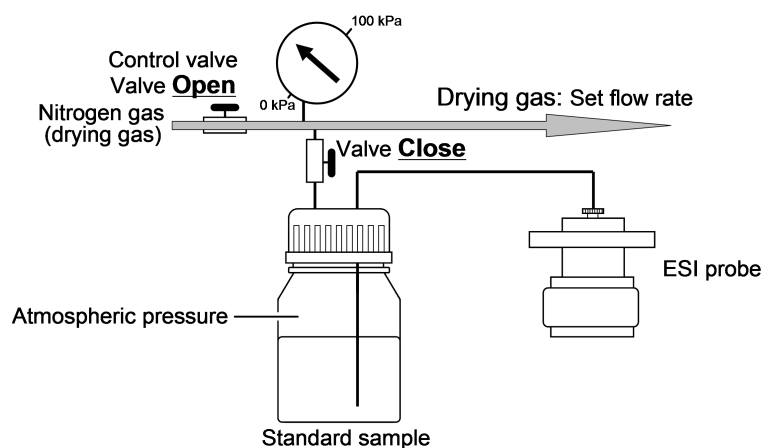
1

Turn the drying gas OFF and open the valve to the standard sample to open the inside of the standard sample bottle to atmospheric pressure.



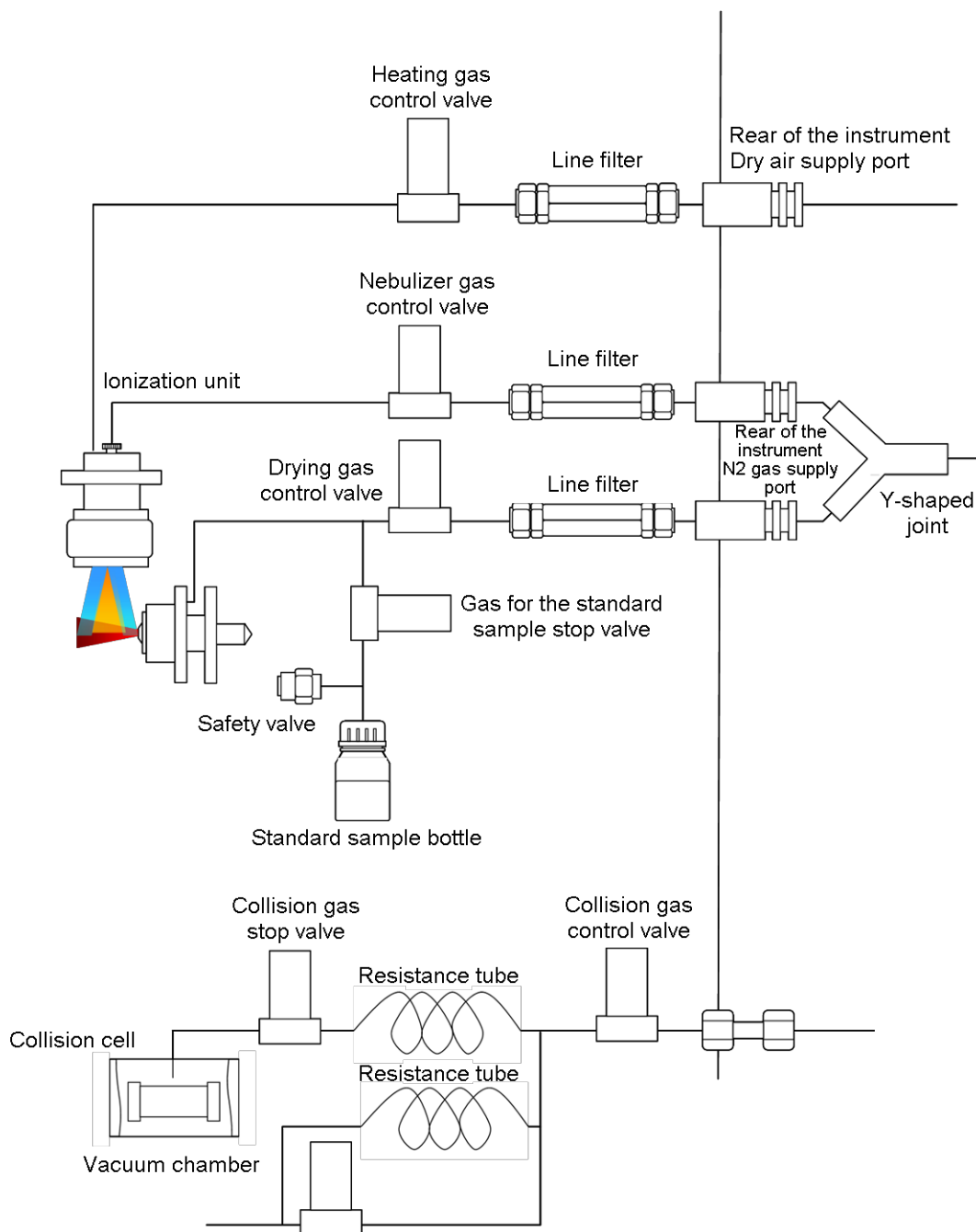
2

Close the valve to the standard sample and control the drying gas to the set flow rate.



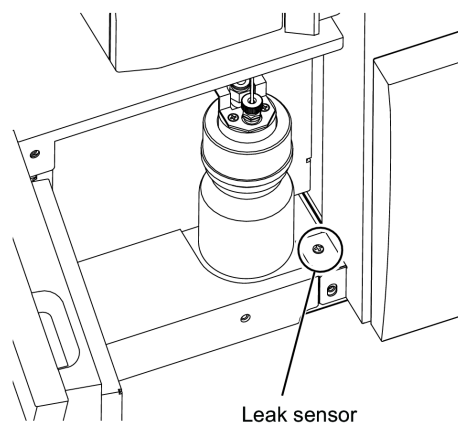
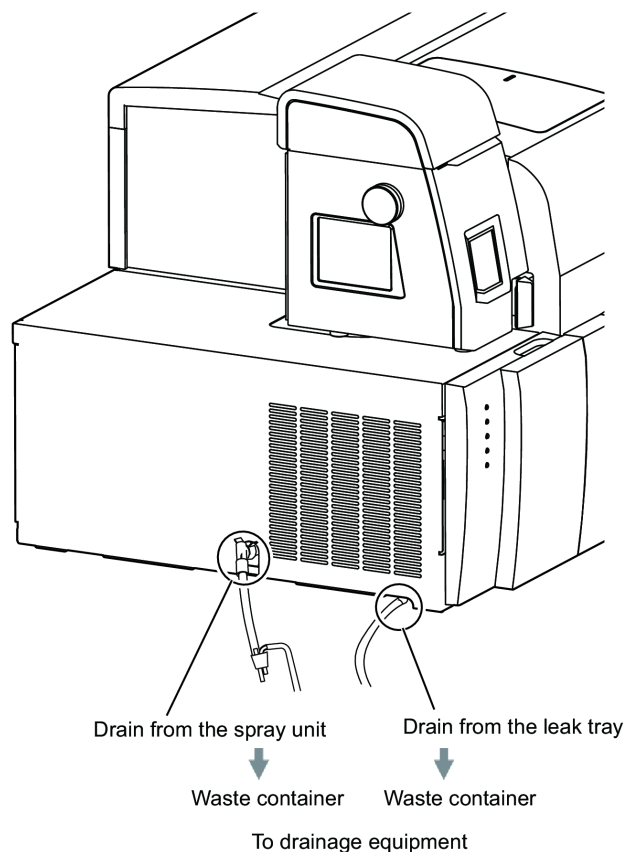
2.11 Gas Control System

In the LCMS-8050, the nitrogen gas supply is branched so that it can be used as three types of gas: nebulizer gas, drying gas, and standard sample delivery gas. The gas is controlled and turned ON and OFF with the LabSolutions software.



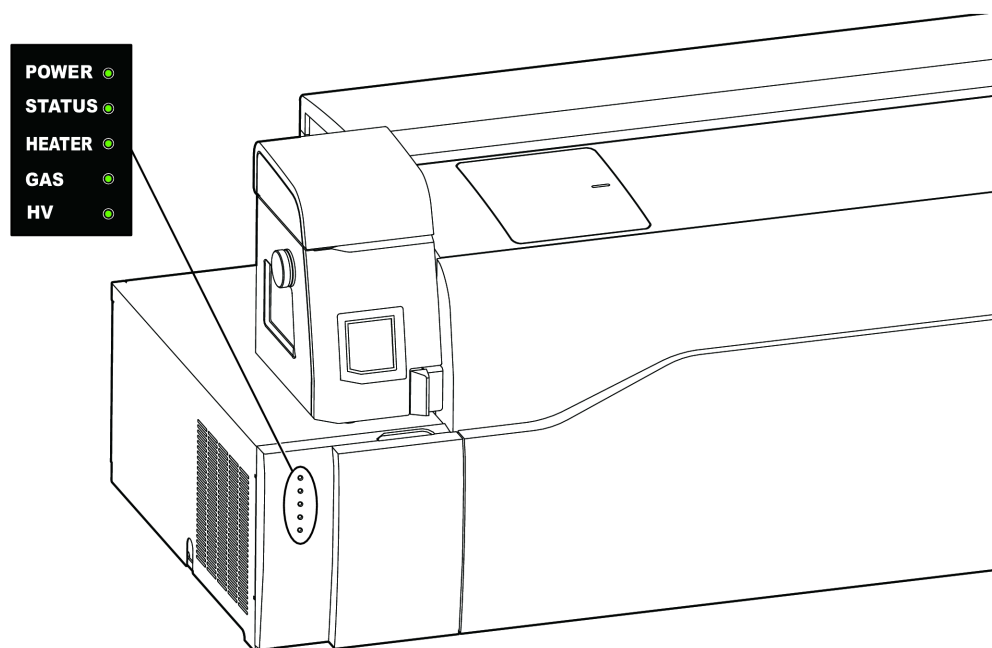
2.12 Waste Drain

The waste drain comprises the drain that drains the solvent sprayed by the atmospheric pressure ionization probe (drain from the spray unit) and the drain from the leak tray. The leak tray is equipped with a leak sensor that detects liquid leakage from the atmospheric pressure ionization probe and liquid leakage from the standard sample bottle.



2.13 Indication Lamps (LEDs)

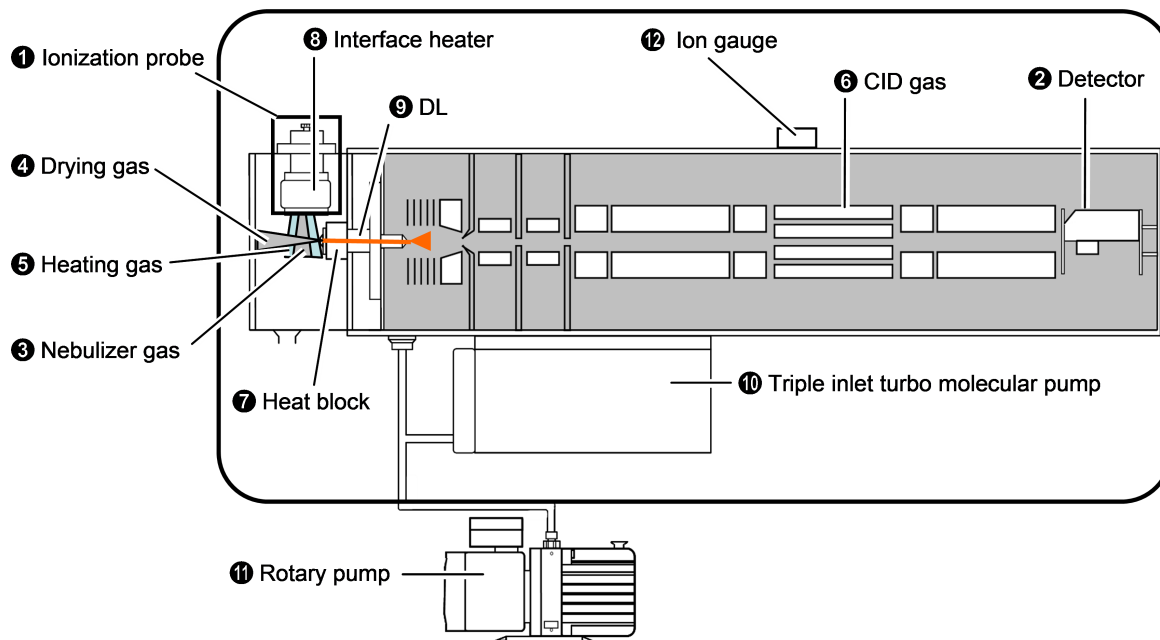
The status of the instrument is shown by indication lamps (LEDs) on the front of the instrument.



Indication Lamps (LED)	LED Light Status	Operating Instrument Part	Instrument Status
HV	OFF	① Ionization voltage (probe voltage, needle voltage) ② Detector voltage (inside the instrument)	OFF
	Lit green	① Ionization voltage (probe voltage, needle voltage) ② Detector voltage (inside the instrument)	ON
GAS	OFF	③ Nebulizer gas ④ Drying gas ⑤ Heating gas ⑥ CID gas	OFF
	Lit green	③ Nebulizer gas ④ Drying gas ⑤ Heating gas	ON
	Flashing green	③ Nebulizer gas ④ Drying gas ⑤ Heating gas	OFF
		⑥ CID gas	ON

Indication Lamps (LED)	LED Light Status	Operating Instrument Part	Instrument Status
HEATER	OFF	7 Heat block 8 Interface heater 9 DL	OFF
	Lit green	7 Heat block 8 Interface heater 9 DL	ON
STATUS	OFF	Power supply to the instrument	OFF
	Lit green	10 Triple inlet turbo molecular pump 11 Rotary pump 12 Ion gauge	Vacuum preparation complete
	Flashing green	10 Triple inlet turbo molecular pump 11 Rotary pump 12 Ion gauge	Preparing for evacuation or in standby mode
	Flashing red	10 Triple inlet turbo molecular pump 11 Rotary pump	Vacuum error (triple inlet turbo molecular pump error)
POWER	OFF	Power supply to the instrument	OFF
	Lit green	Power supply to the instrument	ON

Note: The numbers ❶ to ❷ correspond to the operating parts in the figure below.



3 Preparation

This chapter explains how to start and stop the instrument and the preparations to make before starting analysis.

Some parts of these explanations relate to the LabSolutions software. For more detail, refer to the "LabSolutions Instruction Manual". Also, operate each LC unit in accordance with the instruction manual provided for it.

3.1 Starting the Instrument

3.1.1 Turning the Power ON

1

Turn ON the power to each of the LC and MS units.

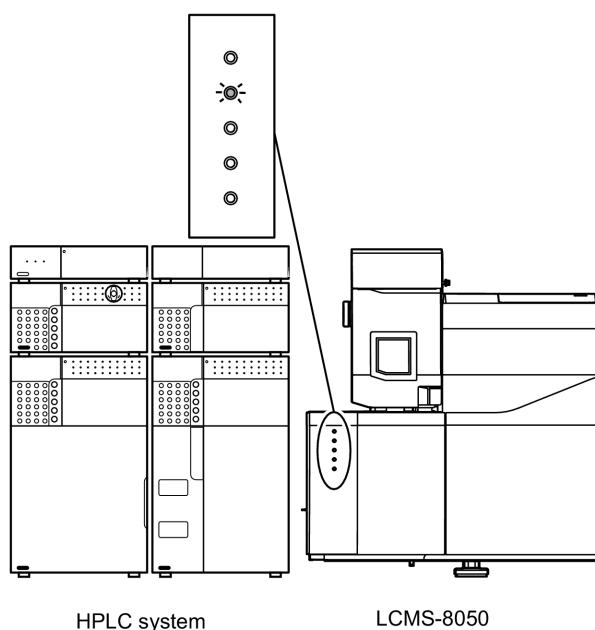
The POWER indication lamp on the front of the LCMS-8050 will light in green and the STATUS indication lamp will flash in green.

CAUTION



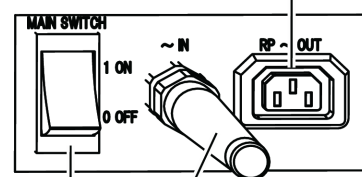
Prohibition

For the connector that supplies power to the rotary pump:
Do not use this connector other than for the rotary pump.



[Rear View]

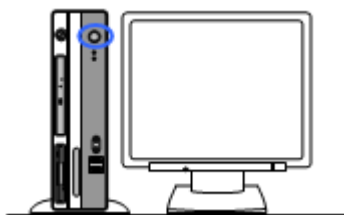
Connector for supplying power to the rotary pump
AC230 V 50/60 Hz



Instrument power cable
AC230 V 50/60 Hz

Power switch
Circuit protector, 15 A (S)
If the current exceeds 15 A, the power is
shut off automatically.
I: Power is supplied (ON).
O: Power is not supplied (OFF).
~: Indicates AC voltage.

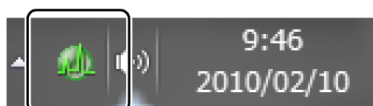
- 2 Turn on the peripheral units (monitor, printer, etc.), turn on the power to the PC and start Windows®.



3.1.2 Starting the Vacuum System

- 1 Open the valve of the CID gas cylinder.

- 2 Check that the [LabSolutions Service] icon is green.

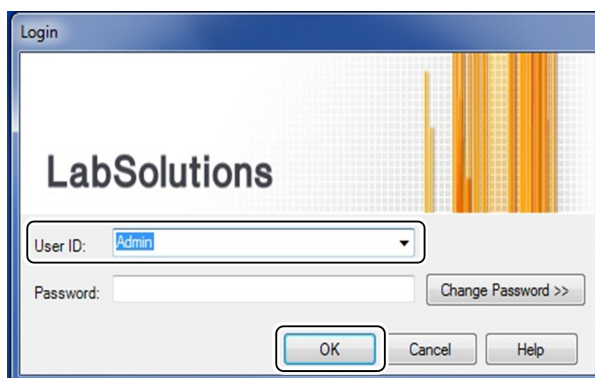


If this icon is yellow it means that the system is still starting up, so please wait a while. If the icon is red, an error has occurred and you must restart the computer.

- 3 Double-click  on the desktop.

- 4 Log in.

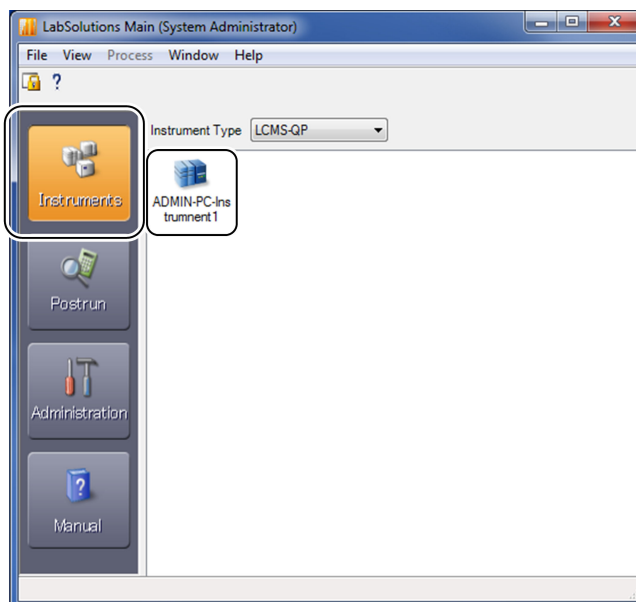
- 1 Enter "Admin" at [User ID:], then click the [OK] button without entering anything in the [Password:] textbox.
- 2 To change the user or add a user, make the change you want to and log in.



5

Start the analysis program.

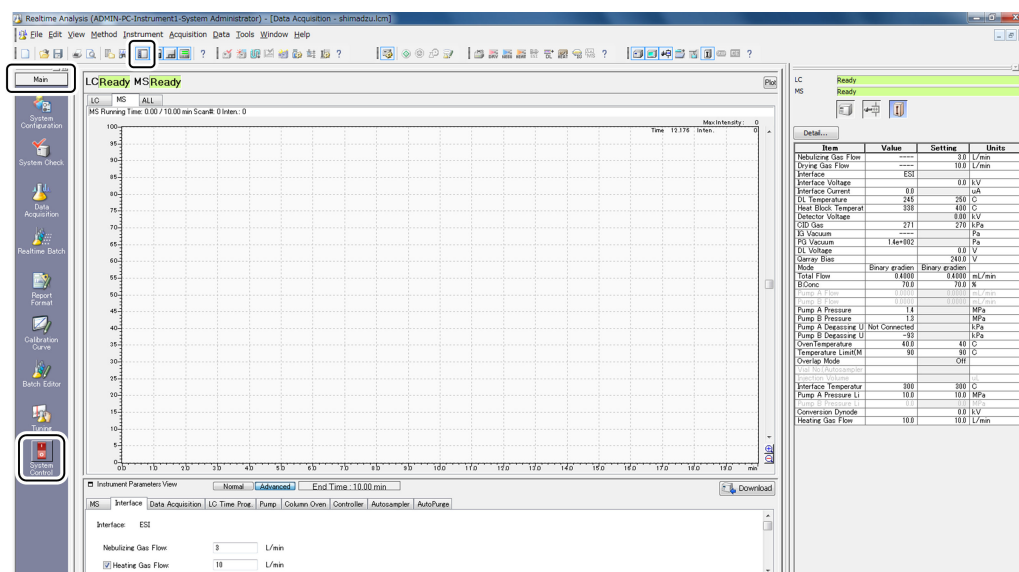
- 1 Click  and then double-click  .



6

Open the [Data Acquisition] window and click  (System Control).

- 1 Click  (Main).
- 2 If the assistant bar is not displayed, click .



The instrument's [System Control] window will be displayed.

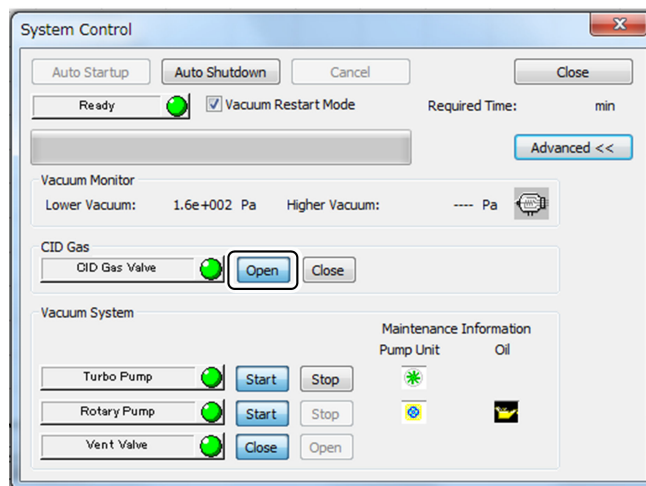
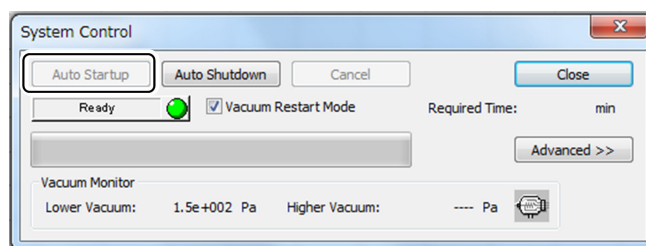
7

Click [Auto Startup].

The rotary pump will start, followed by the triple inlet turbo molecular pump. Evacuation preparations are completed in about one hour, after which the "STATUS" indicator lamp lights up in green.

(If evacuation is stopped for an extended period of time, wait half to a whole day after performing evacuation prior to starting analysis.)

NOTE If the system has been automatically started while the CID gas valve is closed, open the main cock on the CID gas cylinder, click [Advanced], and then click [Open] for [CID Gas valve].



3

! CAUTION

Instruction

Starting the rotary pump when the temperature is low.

When the instrument has been stopped for a long time when the ambient temperature is low, for example in the winter, the viscosity of the oil in the rotary pump increases.

Starting the rotary pump under these conditions can impose an excessive load on the motor, actuating the breakers at the instrument and the distribution panel.

If this happens, turn on the heating in the room and start the vacuum system once the temperature of the rotary pump (the temperature of the instrument's installation environment) has reached at least 18 °C.



Instruction

Supply CID gas to the instrument when starting the vacuum system.

This enables the CID gas to flow and purge the ducts.



Prohibition

Do NOT turn the rotary pump ON and OFF repeatedly in a short time.

Doing so may cause damage to the rotary pump. For details on these checks, refer to 5 "Maintenance" in the separately attached E2M28 instruction manual (A373-10-880).

■ Using a DL plug for efficient evacuation

When starting the vacuum system you can shorten the starting time by sealing the DL with a DL plug.

The shutter can also protect the internal parts of the vacuum system from contamination when the instrument is not to be used for a long time.

! WARNING

Instruction

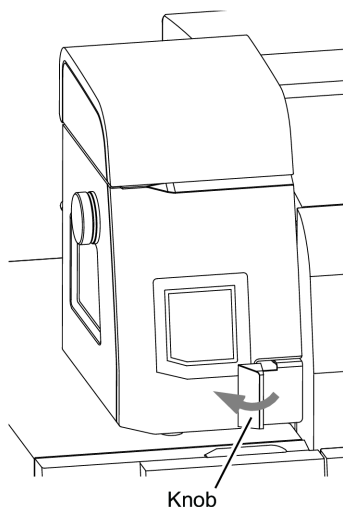
Before starting maintenance work, turn the high-voltage OFF in the LabSolutions program.

If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference ["4.3 Turning the High Voltage ON/OFF" P.100](#)

1

Unlock the ionization unit by sliding its knob to the left.



3

2

Grip the ionization unit and pull towards you.

WARNING

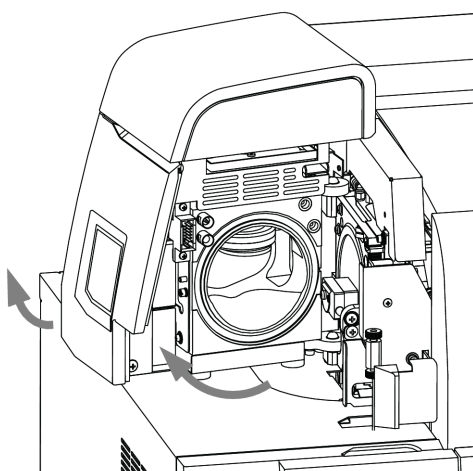


Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the ionization unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you may sustain burns.

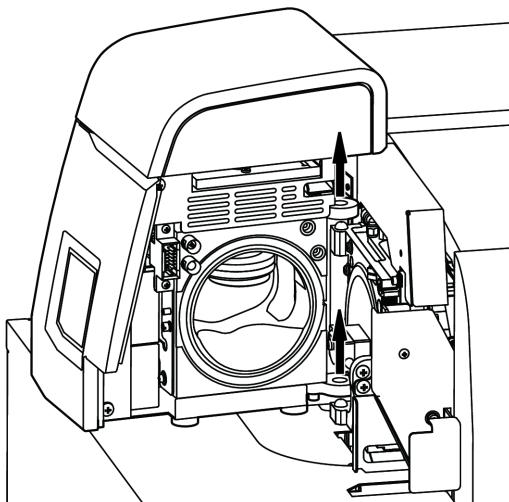
►► Reference ["4.1 Heater ON/OFF Status and Temperature Monitor" P.94](#)



3

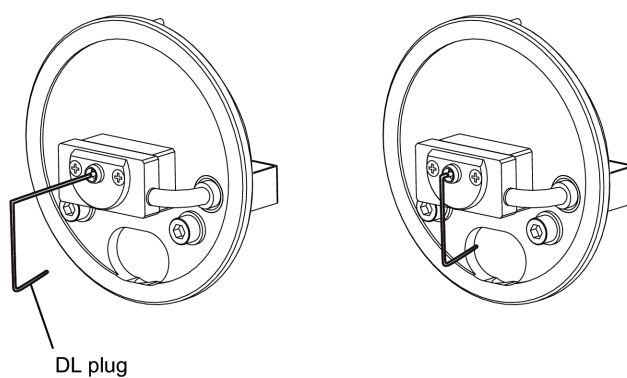
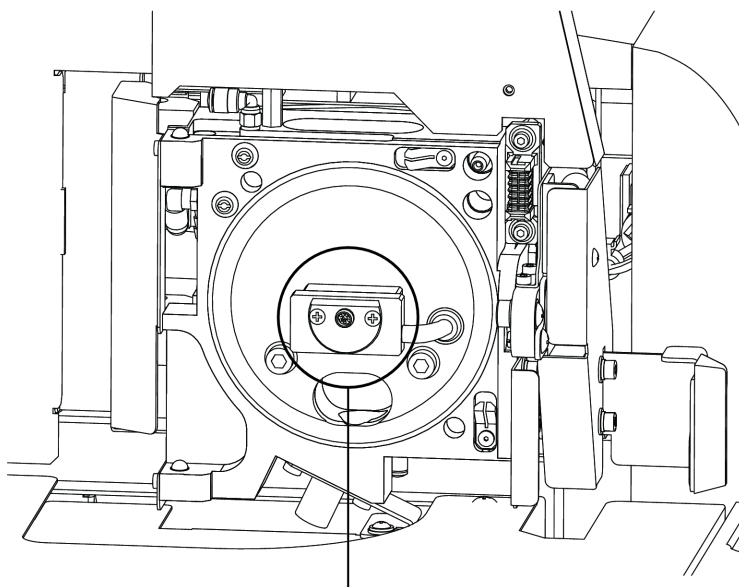
Lift the ionization unit upward to remove it.

NOTE When removing the ionization unit, hold its exterior.



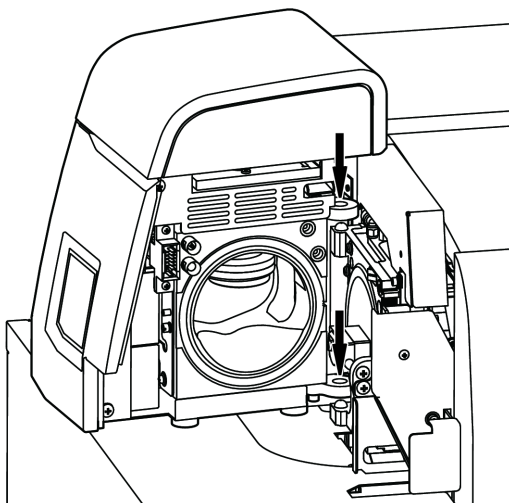
4**Insert the DL plug into the DL center hole.**

NOTE Take care not to bend the DL plug.

**3**

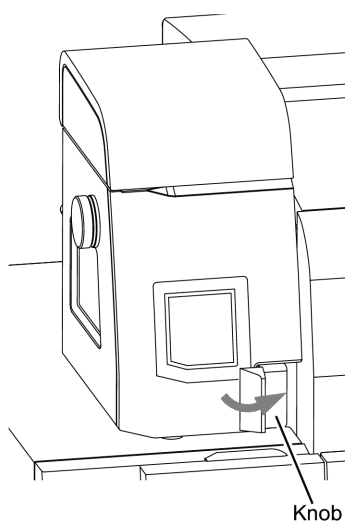
5

Place the ionization unit on its hinges as shown below.



6

Close the ionization unit and lock the unit by sliding its knob to the right.



NOTE The DL plug must be removed before starting analysis.

3.2 Stopping the Instrument

This section describes the procedure for stopping the instrument's vacuum system and up to turning the power OFF.

Hint The vacuum status affects the instrument's sensitivity. With the exception of situations where the instrument is not used for a long time, the instrument's vacuum system should be kept on in order to maintain a high vacuum in everyday use. (For details on daily shutdown of the instrument, see "3.4 Daily Shutdown" P.59.)

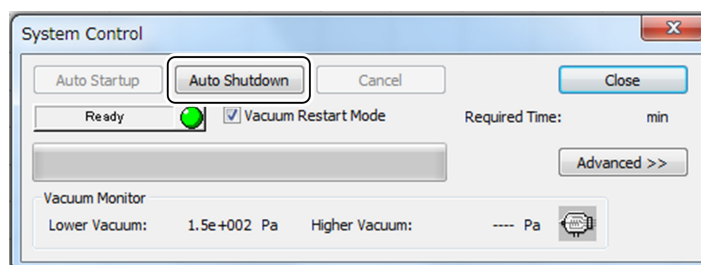
3.2.1 Stopping the Vacuum System

1 Open the [System Control] window.

▶▶ Reference "3.1.2 Starting the Vacuum System" P.45

2 Click [Auto Shutdown].

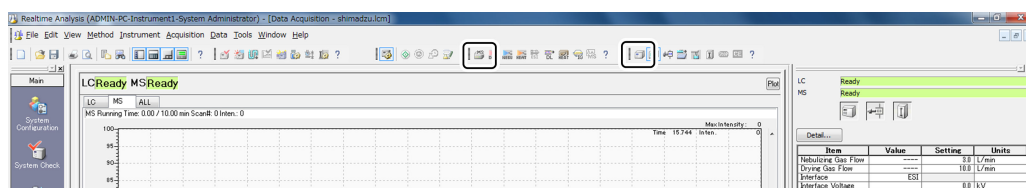
If the temperature of the heat block and DL decreases below 100 °C, the triple inlet turbo molecular pump and the rotary pump will stop and the inside of the vacuum housing will be opened to atmospheric pressure. It takes approximately 3 minutes to equalize with atmospheric pressure.



3.2.2 Exiting LabSolutions

1 Turn off the operation of the LC and MS.

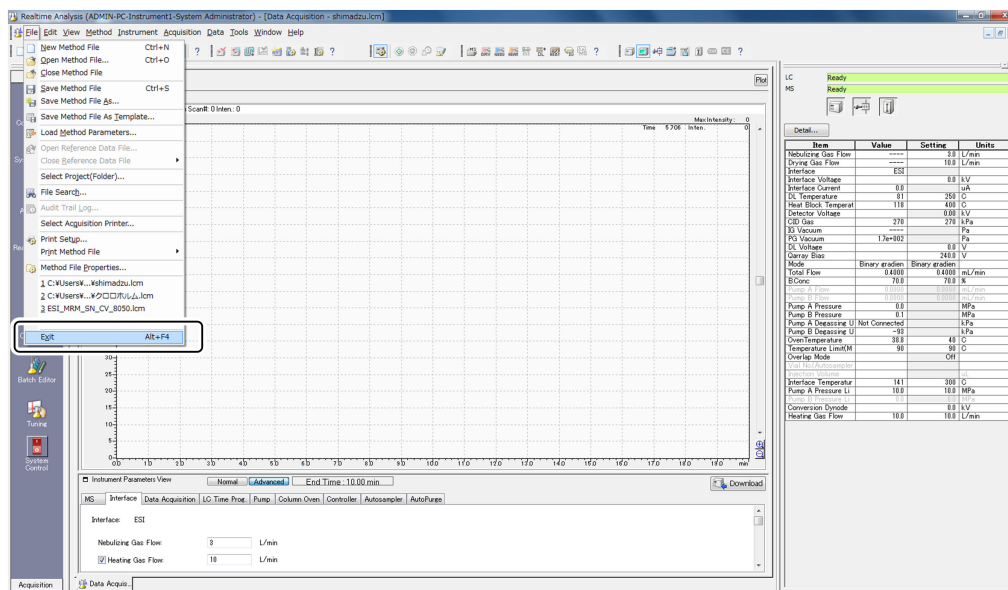
1 Click  and .



2

Close the open window.

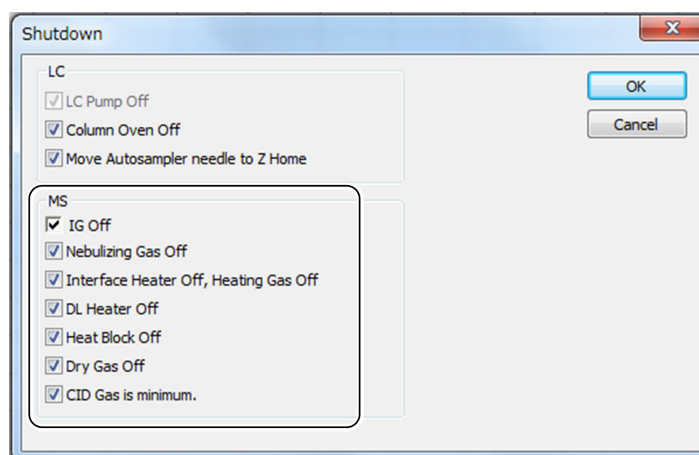
1 Click the [File] menu and select [Exit].



The [ShutDown] window is displayed.

3

Select all the items and click [OK].

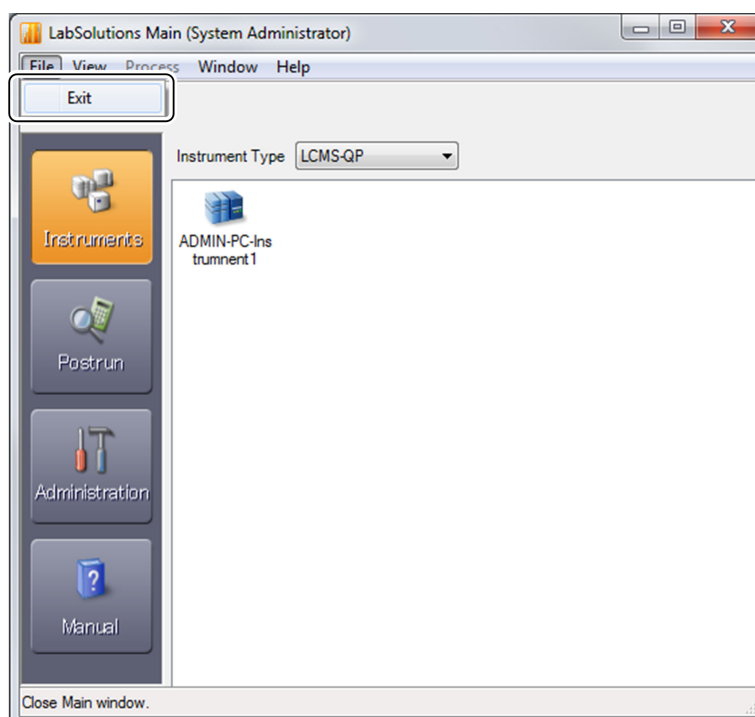


NOTE Even after the interface heater has been turned OFF, the heating gas will remain ON until the interface heater cools down below the specified temperature.

Shutdown processing will be performed.

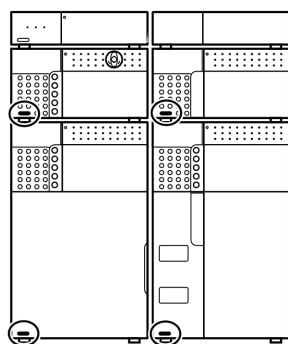
4**Exit LabSolutions.**

- 1 Click the [File] menu and select [Exit].

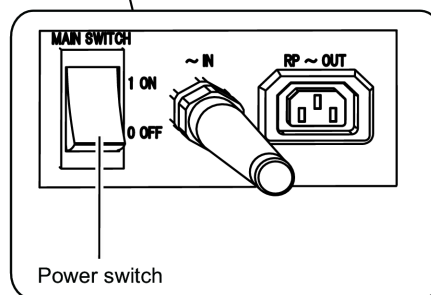
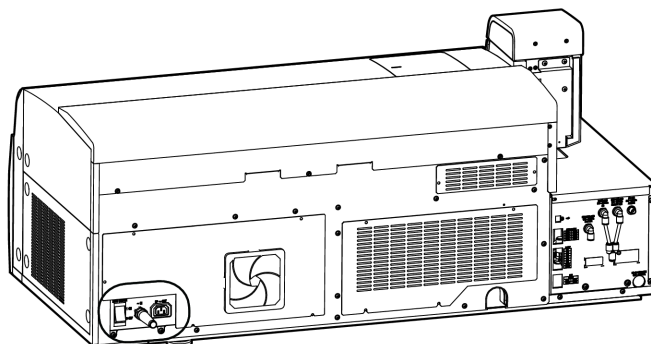


3.2.3 Turning the Power OFF

- 1 Turn off the power to each unit of the LC and MS.



HPLC system



 **Hint** In everyday operation, don't turn OFF the power to the LCMS-8050.

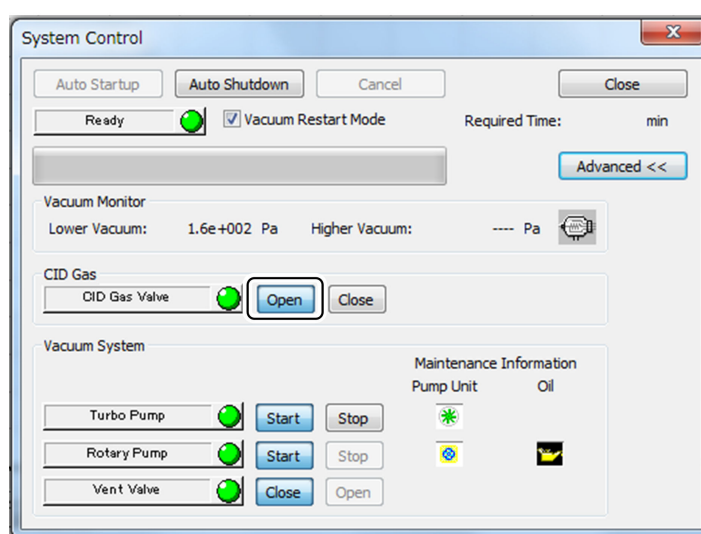
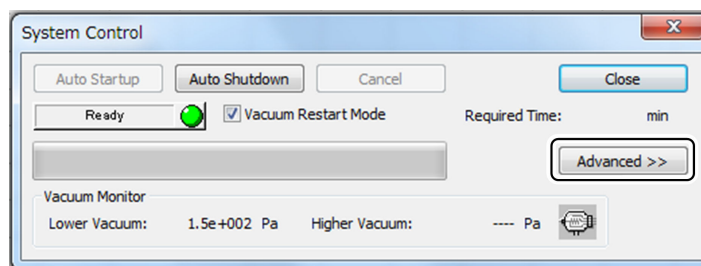
- 2 Close the valve of the CID gas cylinder.

- 3 Turn off the nitrogen gas/dry air generator.

5

Open the valve of the CID gas cylinder if it is closed.

In this case, click [Advanced], then click [Open] for [CID Gas valve].



6

Remove the DL plug if it is mounted.

7

Turn on the LC pump and oven, and the LCMS heat block, DL heater, interface heater, and gas, and start operation.

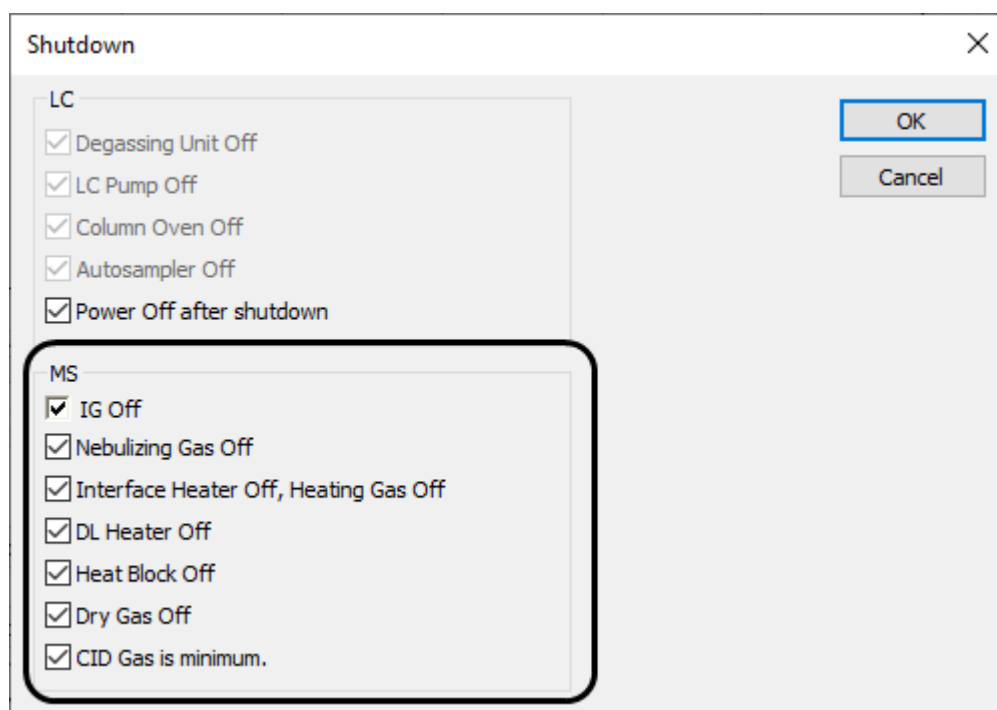
- NOTE**
- The pump cannot be turned ON when the nebulizer gas is OFF.
 - The interface heater cannot be turned ON when the heating gas is OFF.

3.4 Daily Shutdown

Hint The vacuum status affects the instrument's sensitivity. With the exception of situations where the instrument is not used for a long time, the instrument's vacuum system should be kept on in order to maintain a high vacuum in everyday use.

NOTE If you keep the heater turned on so that you can quickly resume analysis, keep also the gas turned on. Turning off the gas may cause the ambient atmosphere to flow into vacuum, contaminating the interior of the instrument.

1 Exit LabSolutions.



NOTE Even after the interface heater has been turned OFF, the heating gas will remain ON until the interface heater cools down below the specified temperature.

▶▶ Reference ["3.2.2 Exiting LabSolutions" P.53](#)

2 Stop the supply of nitrogen gas and dry air (by turning the nitrogen gas/dry air generator OFF).

3 Turn OFF the power of every LC unit.

4

Mount the DL plug.

WARNING



Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the ionization unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you may sustain burns.

▶▶ Reference ["4.1 Heater ON/OFF Status and Temperature Monitor" P.94](#)

3.5 Preparation for ESI Analysis

CAUTION



Instruction

When performing ESI analysis in which a halogenated mobile phase additive is used, note the following:

In the ESI method, the analyte is heated to high temperatures. If the mobile phase contains a halogenated compound such as chloroform, a corrosive gas will be produced. Even a small percentage concentration of halogens in the mobile phase can cause corrosion.

Use SUS tubes to connect the high performance liquid chromatograph to the instrument. PEEK resin tubes do not have sufficient strength and should they rupture, solvent may blow out.

Black particles may build up inside the ESI unit, and around the DL and the heat block.

Because of exposure to corrosive gases, you may need to replace the following parts at a shorter interval than specified.

Part Name	Part No.
Capillary ASSY	S225-14948-91
Heater ASSY	S225-19560-41
Heater flange	S225-19463-41
DL ASSY2	S225-15718-42

3.5.1 Mounting the ESI Unit

1

Take the ESI unit out of its packing and check the projection length of the capillary tube.

NOTE Check also that no dirt or dust is adhered to the tip of the capillary.

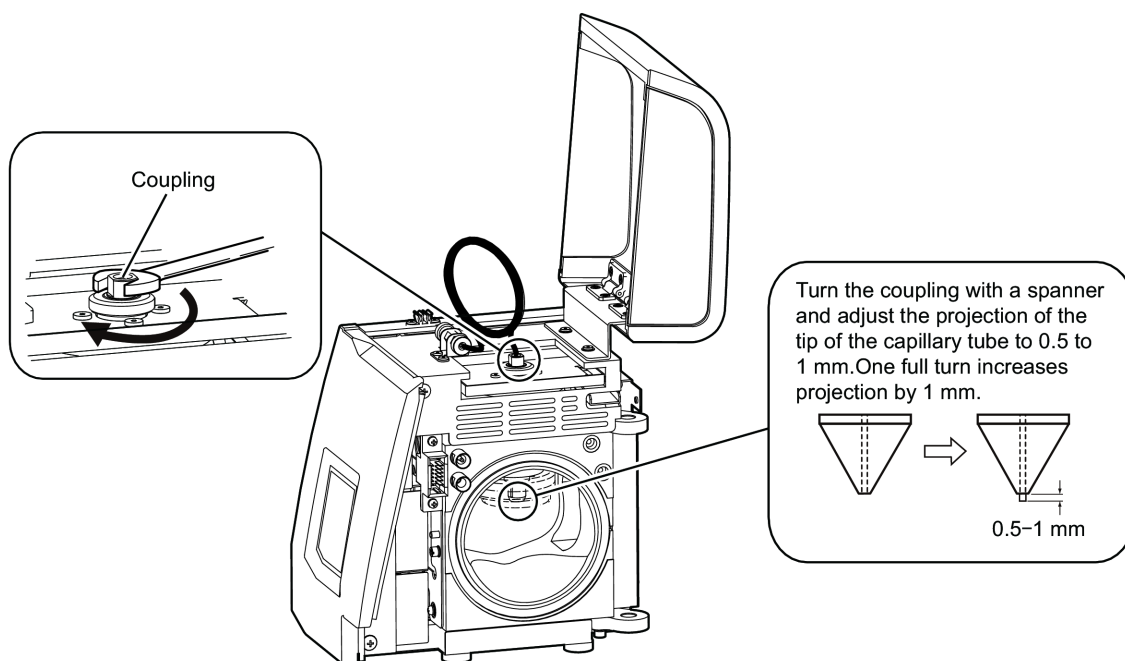
▶▶ Reference "7.2 Maintenance of the ESI Unit" P.125

! CAUTION



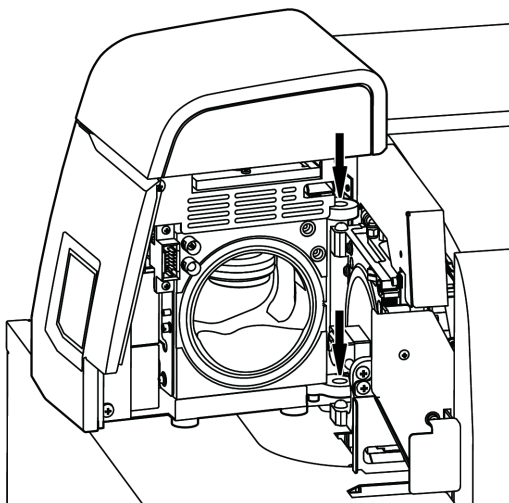
Prohibition

Do NOT knock the tip of the capillary tube against anything or contaminate it. This may reduce sensitivity.

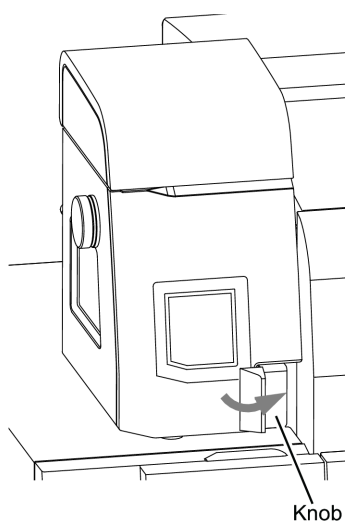


2

Place the ESI unit on its hinges as shown below.

**3**

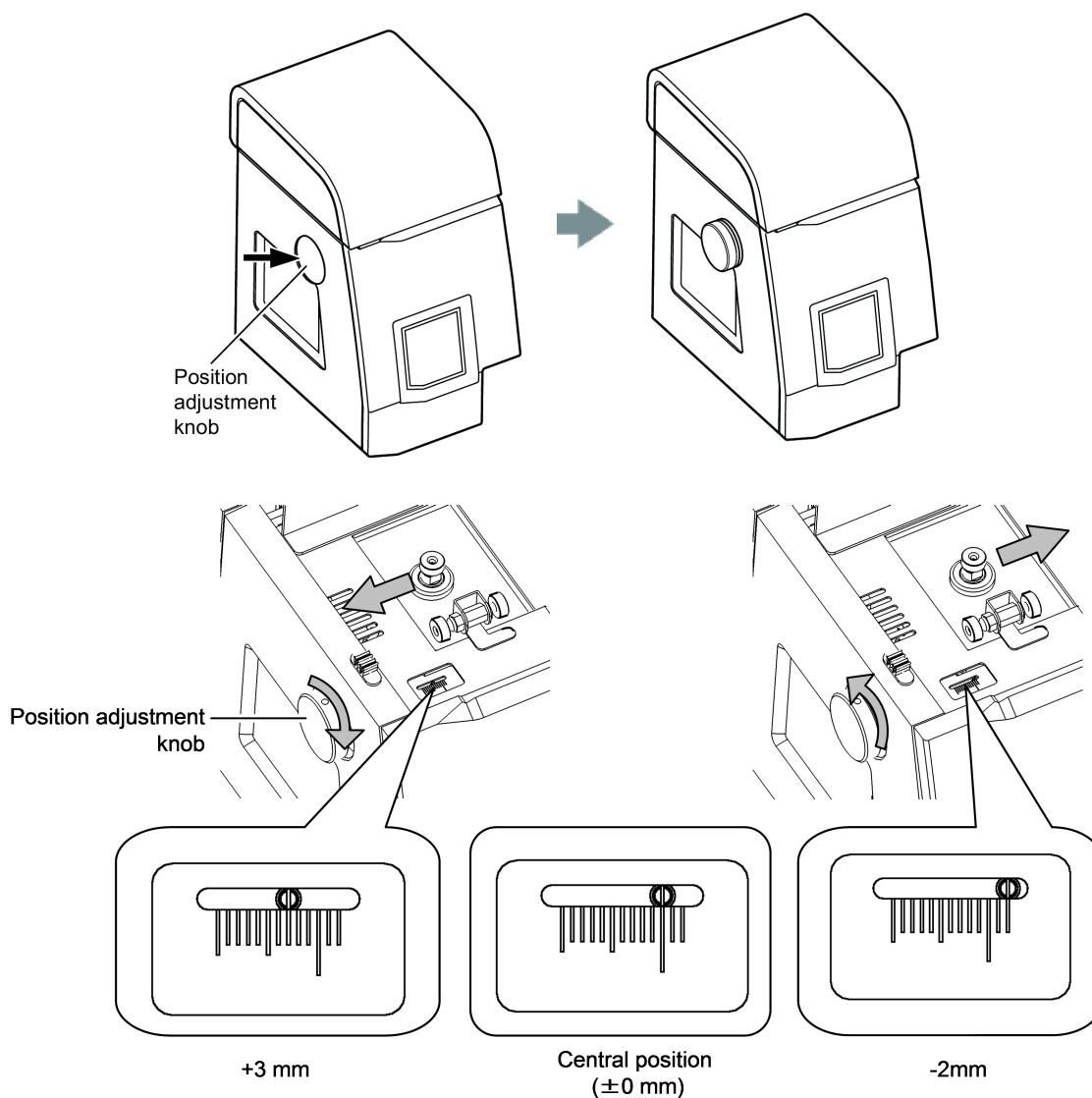
Close the ESI unit and lock the unit by sliding its knob to the right.



4

Check the spray position.

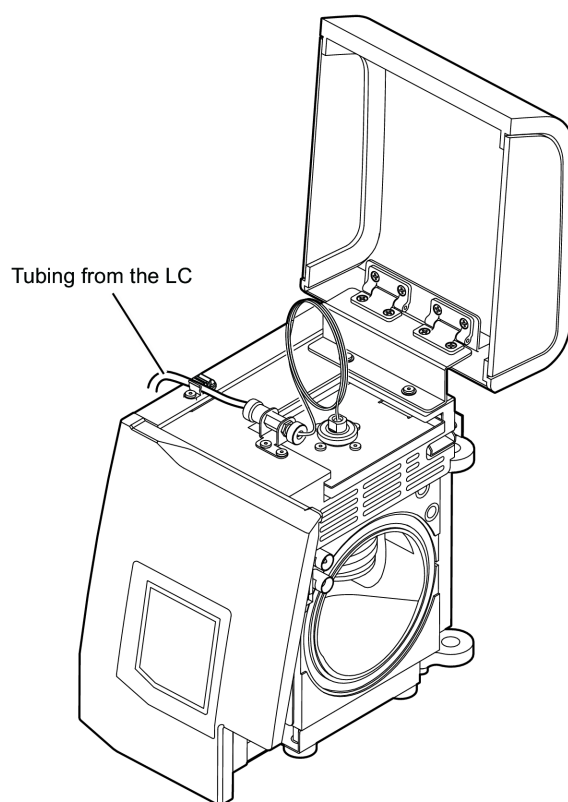
You can adjust the spray position by turning the position adjustment knob. To adjust the spray position, first press the adjustment knob so that it pops out. After finishing the adjustment, push the adjustment knob back in. This will fix the spray position.

**Hint**

Guide to spray position

Adjust the spray position as necessary to allow maximum sensitivity.

- ESI analysis: 0.2 mL/min to 0.5 mL/min ➡ -1 to +2 mm
1 mL/min ➡ +3 mm or greater
- DUIS analysis: 0 to +3 mm
- Auto tuning: +1.5 mm

5**Connect the tubing from the LC.****3**

3.5.2 Removing the ESI Unit

! WARNING

Instruction

Before removing the ESI unit, turn the high-voltage OFF in the LabSolutions program.

If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference ["4.3 Turning the High Voltage ON/OFF" P.100](#)



Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the ESI unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you may sustain burns.

▶▶ Reference ["4.1 Heater ON/OFF Status and Temperature Monitor" P.94](#)

1

Turn the LC pump OFF and disconnect the tubing from the LC.

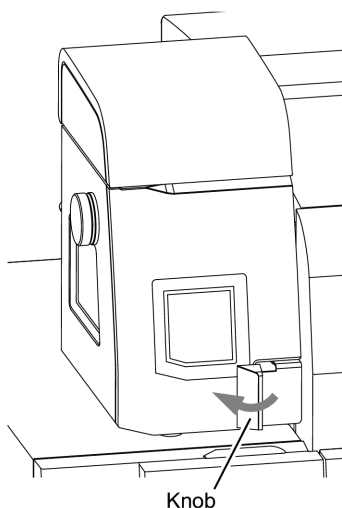
2

Turn the gas OFF from LabSolutions.

▶▶ Reference ["4.2 Gas ON/OFF Status and Flow Rate Monitor" P.97](#)

3

Unlock the ESI unit by sliding its knob to the left.



4

Lift the ESI unit upward to remove it.

! WARNING

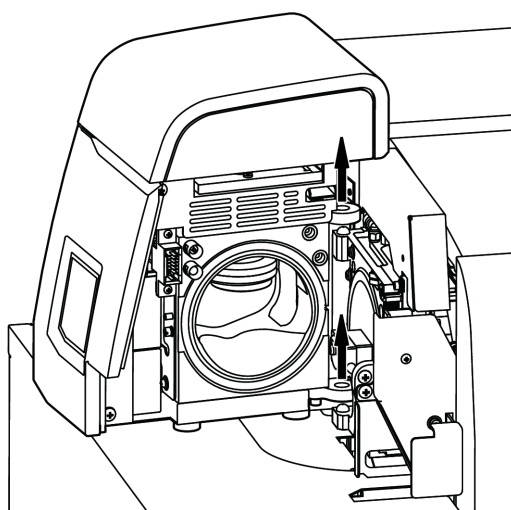


Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the ESI unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you may sustain burns.

▶▶ Reference "4.1 Heater ON/OFF Status and Temperature Monitor" P.94



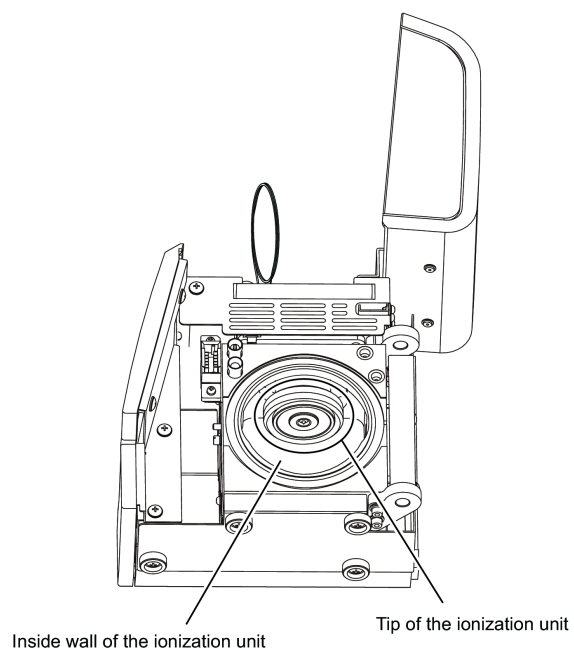
! CAUTION



Prohibition

Do NOT knock the tip of the capillary tube against anything or contaminate it. This may reduce sensitivity.

3



NOTE When removing the ESI unit, hold its exterior.

3.6 Preparation for APCI Analysis

3.6.1 Mounting the Needle Unit

1 Take the APCI unit out of its packaging.

2 Mount the needle unit.

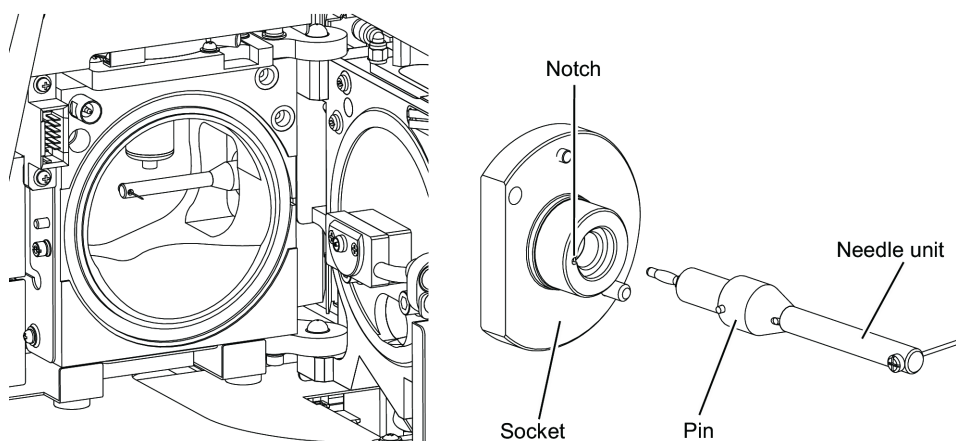
Check that there is no dirt or dust is adhered to the tip of the needle, and insert the needle as far as it will go into the socket, ensuring that the pin is aligned with the notch. Make sure that the tip of the needle unit is positioned in the center of the DL tube.

! WARNING

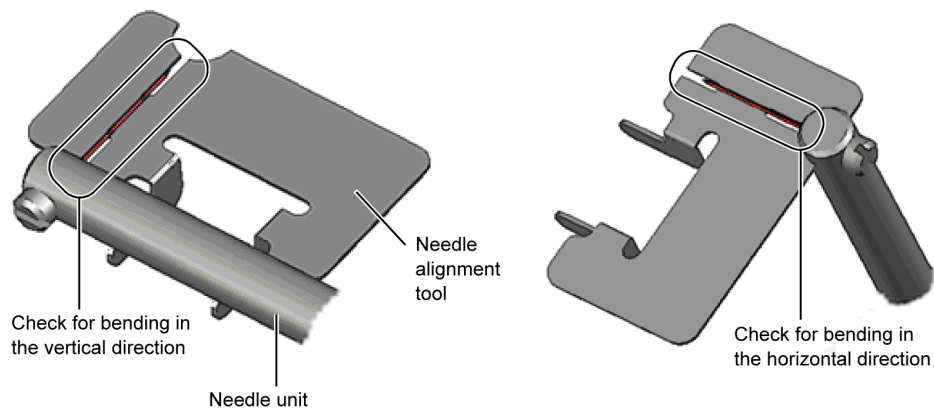


Instruction

Take care because the tip of the corona needle is sharp.



-  **Hint** Check that the tip of the corona needle is not bent by using the needle alignment tool. Check that the needle is contained within the range of the slit and repair the needle if it is bent.



3.6.2 Mounting the APCI Unit

! CAUTION



Instruction

When performing APCI analysis in which a halogenated mobile phase additive is used, note the following:

In the APCI method, the analyte is heated to high temperatures. If the mobile phase contains a halogenated compound such as chloroform, a corrosive gas will be produced. Even a small percentage concentration of halogens in the mobile phase can cause corrosion.

Use SUS tubes to connect the high performance liquid chromatograph to the instrument. PEEK resin tubes do not have sufficient strength and should they rupture, solvent may blow out.

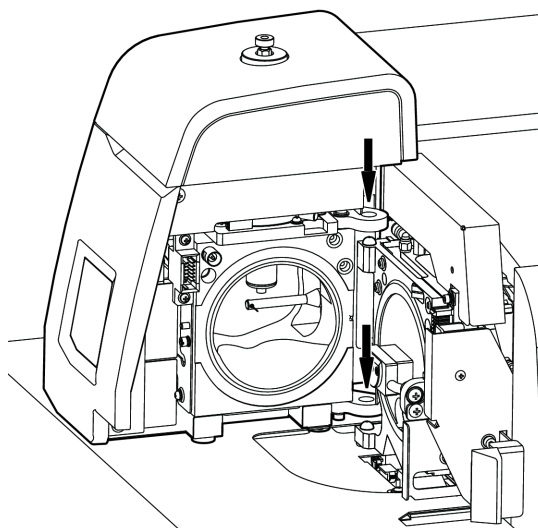
Black particles may build up inside the APCI unit, and around the DL and the heat block.

Because of exposure to corrosive gases, you may need to replace the following parts at a shorter interval than specified.

Part Name	Part No.
APCI pipe ASSY	S225-15845-91
Nebulizer joint ASSY	S225-15788-91
Heater unit ASSY	S225-15619-41
Adapter	S225-04993
Ferrule	S225-03748-03
Nut	S225-15739
Heater flange	S225-19463-41
Needle unit	S225-14290-41
DL ASSY2	S225-15718-42

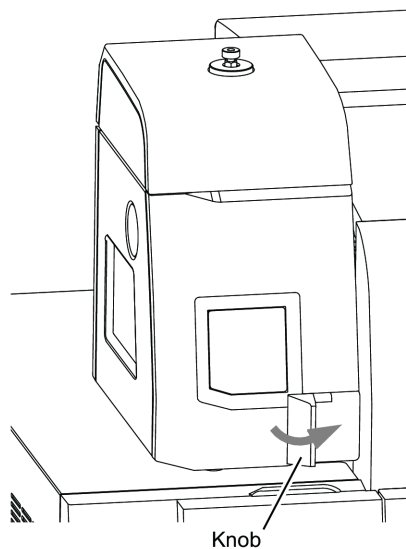
1

Place the APCI unit on its hinges as shown in the figure below.



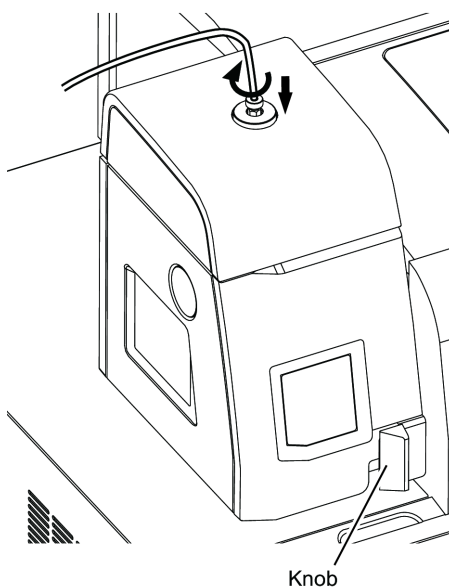
2

Close the APCI unit and lock the unit by sliding its knob to the right.



3

Connect the tubing from the LC.



3.6.3 Removing the APCI Unit

! WARNING



Instruction

Before removing the APCI unit, turn the high-voltage OFF in the LabSolutions program.

If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference "4.3 Turning the High Voltage ON/OFF" P.100



Instruction

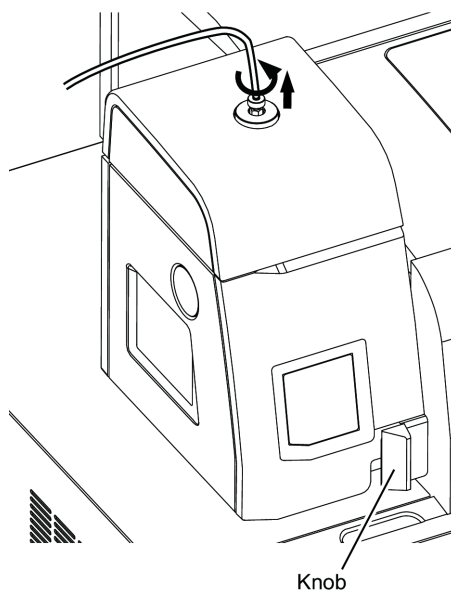
Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the APCI unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you may sustain burns.

▶▶ Reference "4.1 Heater ON/OFF Status and Temperature Monitor" P.94

1

Turn the LC pump OFF and disconnect the tubing from the LC.



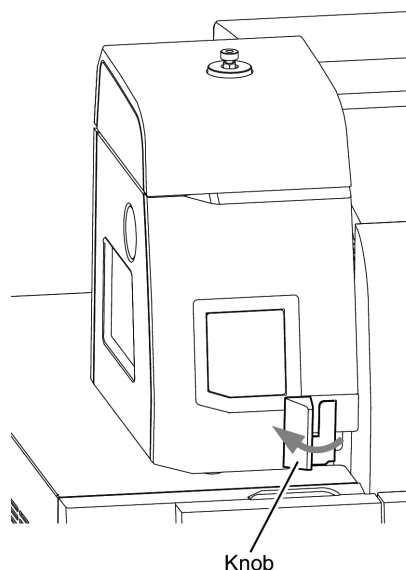
2

Turn the gas OFF from LabSolutions.

▶▶ Reference "4.2 Gas ON/OFF Status and Flow Rate Monitor" P.97

3

Unlock the APCI unit knob.



4

Lift the APCI unit upward to remove it.

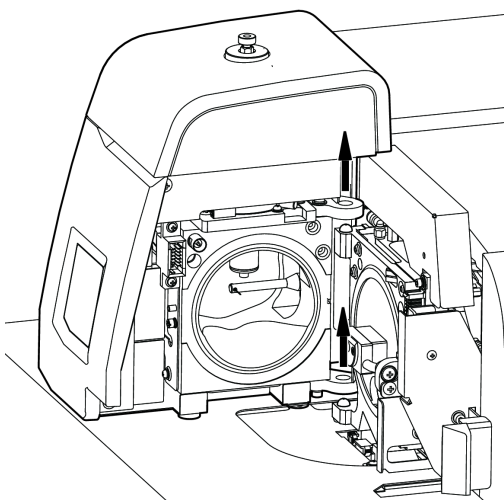
! WARNING

Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the APCI unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you may sustain burns.

►► Reference ["4.1 Heater ON/OFF Status and Temperature Monitor" P.94](#)



NOTE When removing the APCI unit, hold its exterior.

3.6.4 Removing the Needle Unit

1

Remove the APCI unit.

▶▶ Reference "3.6.3 Removing the APCI Unit" P.73

! WARNING



Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the APCI unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work. If you proceed with the work while the temperature is still high, you could sustain burns.

▶▶ Reference "4.1 Heater ON/OFF Status and Temperature Monitor" P.94

2

Remove the needle unit.

! WARNING



Instruction

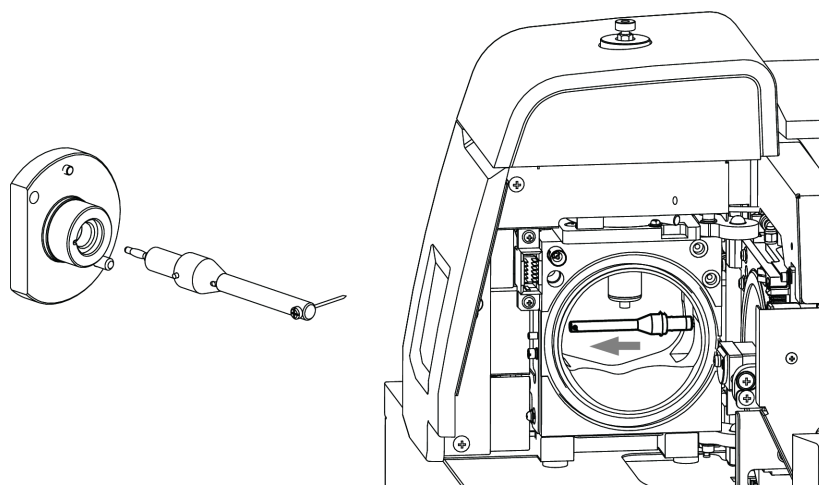
Disconnect the APCI unit before starting this work.

If it is not disconnected there will be a danger of electric shock.



Instruction

Take care because the tip of the corona needle is sharp.



NOTE Remove it in the direction indicated by the arrow.

3

3.7 Preparation for DUIS Analysis

3.7.1 Mounting the Needle Unit

1

Remove the ESI unit.

▶▶ Reference "3.5.2 Removing the ESI Unit" P.66

WARNING



Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the ESI unit, DL, and heat block reach high temperatures. Turn the heater OFF from LabSolutions before starting this work.

If you proceed with the work while the temperature is still high, you could sustain burns.

▶▶ Reference "4.1 Heater ON/OFF Status and Temperature Monitor" P.94

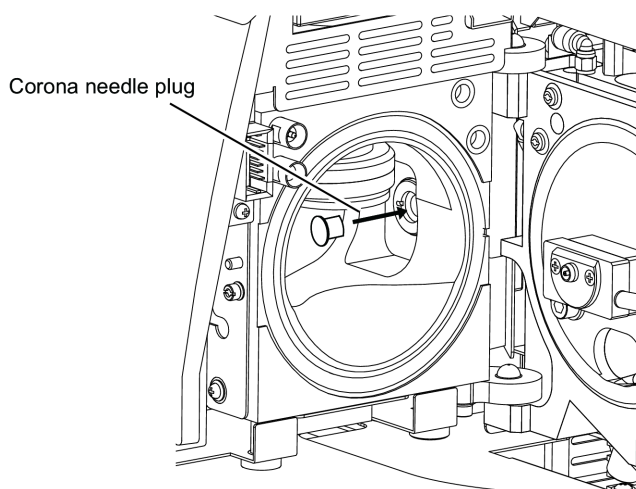
2

Mount the needle unit to the ESI unit.



NOTE

- If a corona needle plug is used in the socket, first remove the plug and check that there is no dirt or dust is adhered to the tip of the needle. Then insert the needle as far as it will go into the socket, ensuring that the pin is aligned with the notch.
- Make sure that the tip of the needle unit is positioned in the center of the DL tube.

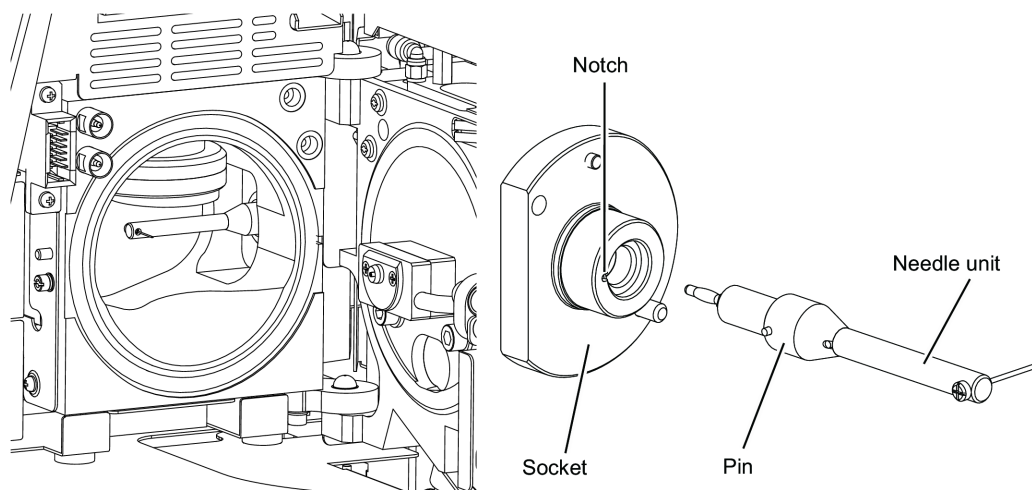


! WARNING



Instruction

Take care because the tip of the corona needle is sharp.

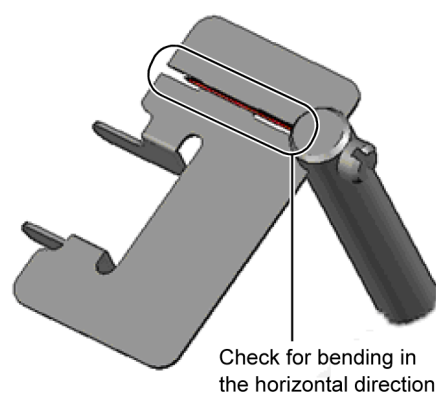
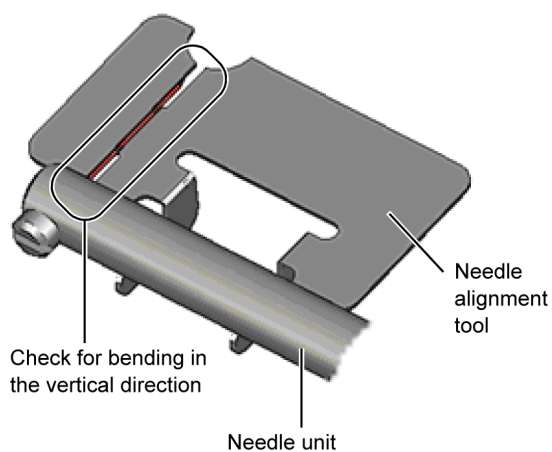


3



Hint

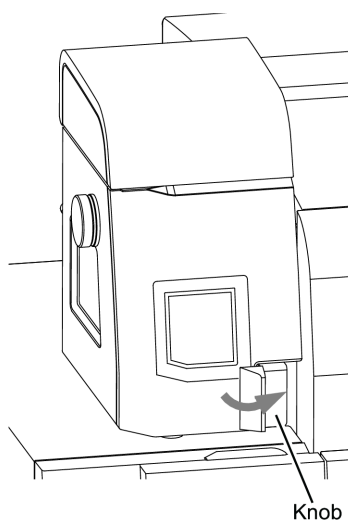
Check that the tip of the corona needle is not bent by using the needle alignment tool. Check that the needle is contained within the range of the slit and repair the needle if it is bent.



3

Close the ESI unit and lock the unit by sliding its knob to the right.

▶▶ Reference ["3.5.1 Mounting the ESI Unit" P.62](#)



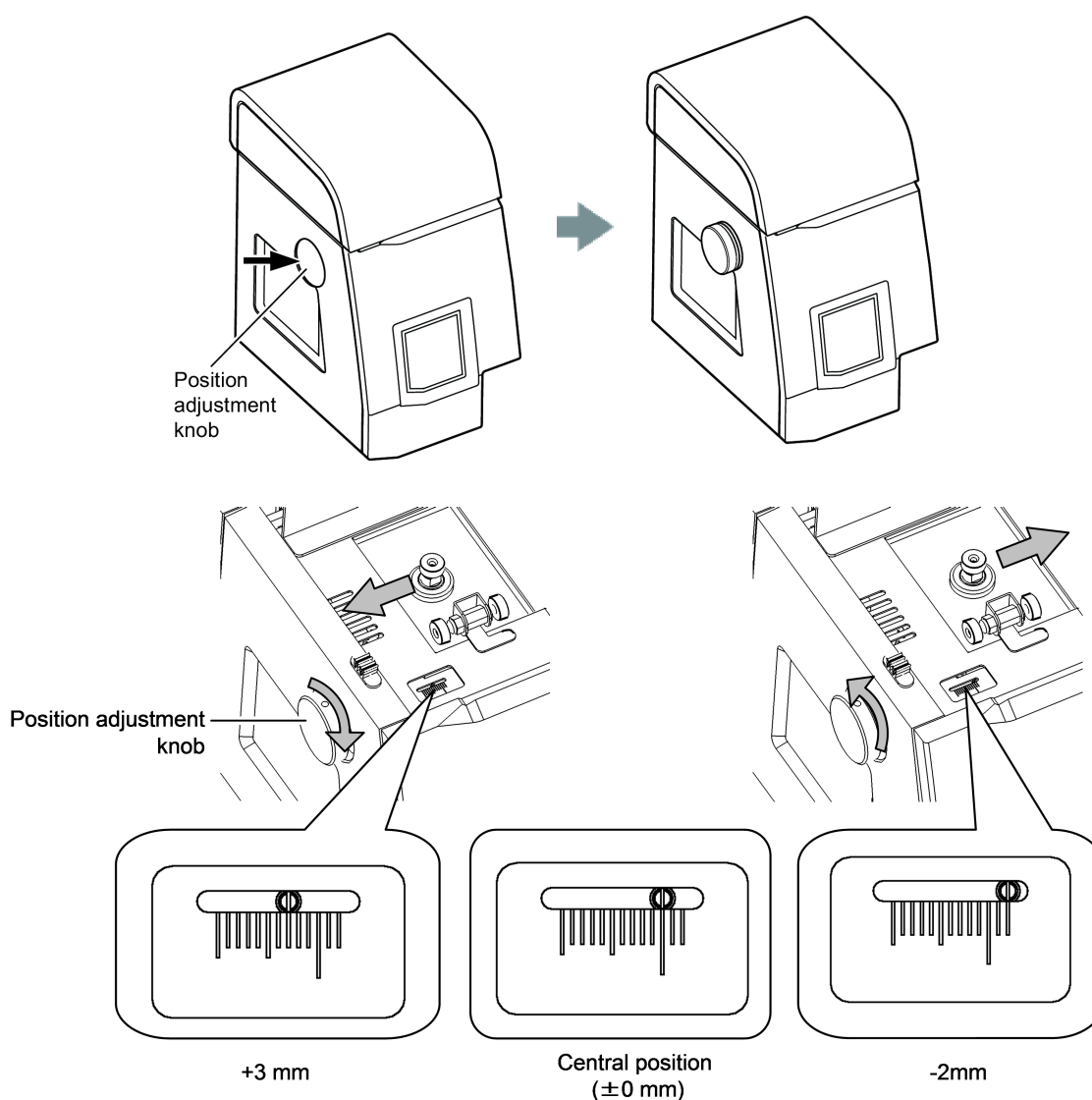
4

Check the spray position.

You can adjust the spray position by turning the position adjustment knob. To adjust the spray position, first press the adjustment knob so that it pops out. For DUIS analysis, adjust the position within the range from 0 to +3 mm.

After finishing the adjustment, push the adjustment knob back in. This will fix the probe position.

 **Hint** Adjust the probe position as necessary to allow maximum sensitivity.



3.7.2 Removing the Needle Unit

1

Remove the ESI unit.

▶▶ Reference "3.5.2 Removing the ESI Unit" P.66

! WARNING



Instruction

Check that the temperature of the DL, heat block, and interface heater has fallen to 50 °C or lower before proceeding with the work.

The inside of the ESI unit, DL, and heat block reach high temperatures.

Turn the heater OFF from LabSolutions before starting this work.

If you proceed with the work while the temperature is still high, you could sustain burns.

▶▶ Reference "4.1 Heater ON/OFF Status and Temperature Monitor" P.94

2

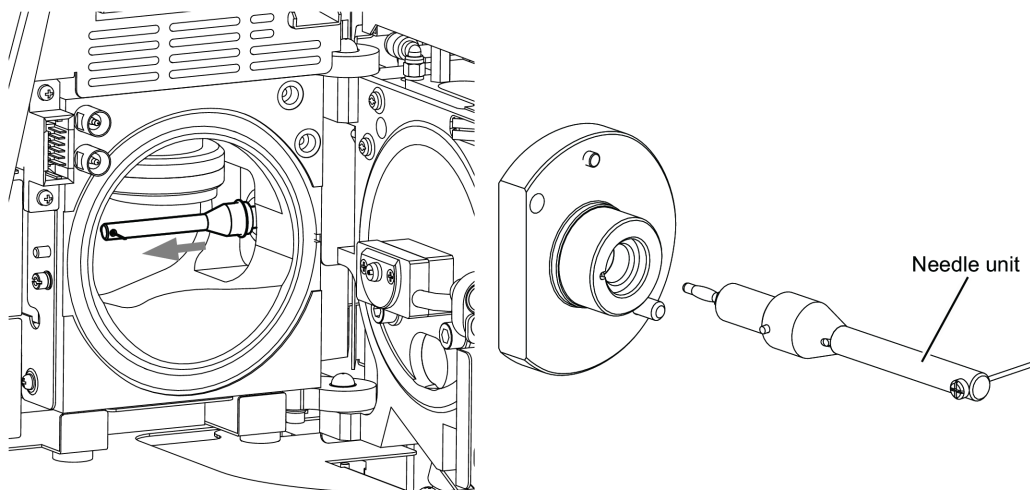
Remove the needle unit.

! CAUTION



Instruction

Take care because the tip of the corona needle is sharp.

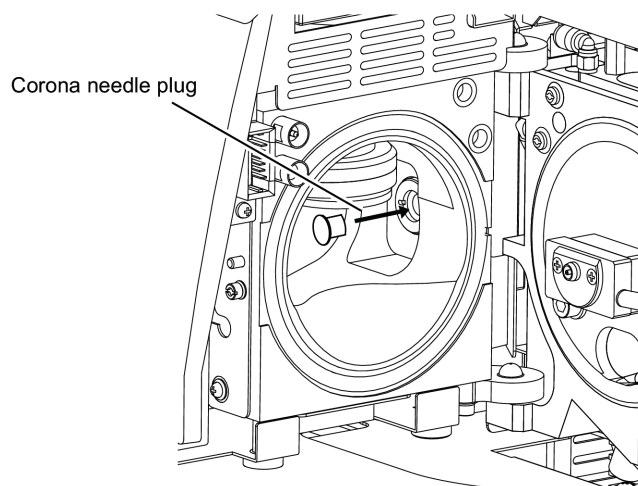


3**Mount the ESI unit.**

▶▶ Reference ["3.5.1 Mounting the ESI Unit" P.62](#)

**Hint**

When carrying out measurement in the ESI mode with the needle unit removed, fit the corona needle plug in order to prevent contamination of the parts where high voltages are applied.



3.8 Auto Tuning

Carry out auto tuning using the ESI to perform sensitivity adjustment, resolution adjustment and mass calibration of the instrument.

Perform auto tuning when you have stopped the vacuum system to carry out maintenance inside the instrument, when the instrument does not work correctly, or when the instrument has not been operated for a long period of time. Wait half to a whole day after performing evacuation prior to starting auto tuning.

NOTE Remove the needle unit before performing auto tuning in the DUIS mode.

▶▶ Reference ["3.7.2 Removing the Needle Unit" P.80](#)

NOTE Always perform auto tuning after replacing the detector.

3.8.1 Preparing the Standard Sample

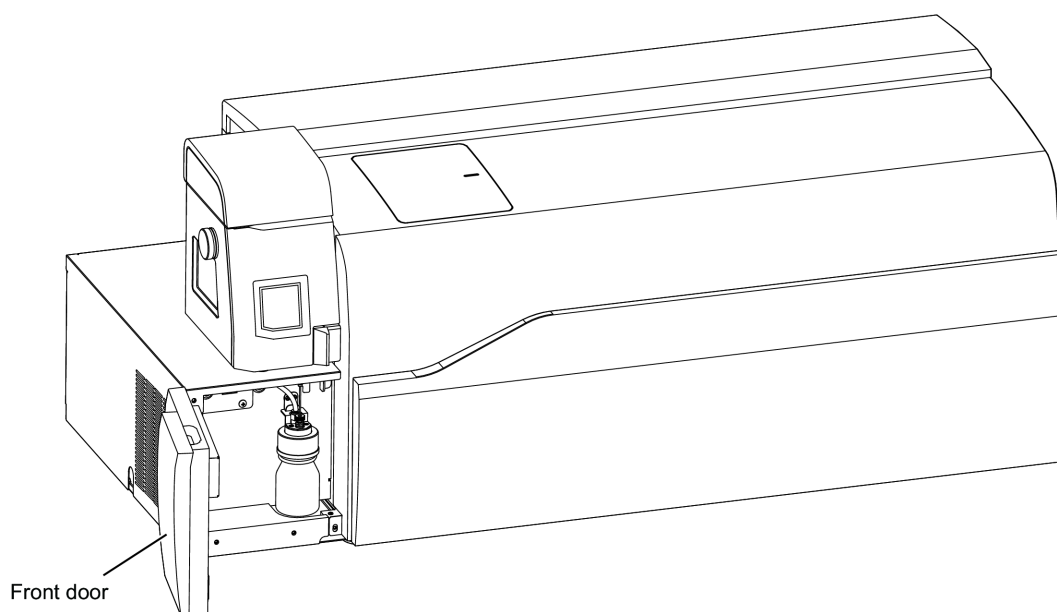
Prepare the standard sample before starting auto tuning.

1

Open the front door and pour the standard sample solution into the standard sample bottle.

If the tubing projects above the surface of the liquid it means that sample pumping is not possible. As a guide, make sure that there is 40 to 80 mL in the bottle. One execution of auto tuning uses approximately 1 mL.

▶▶ Reference ["7.6 Maintenance of the Standard Sample Introduction Unit" P.162](#)
["8.3 Standard Sample" P.233](#)

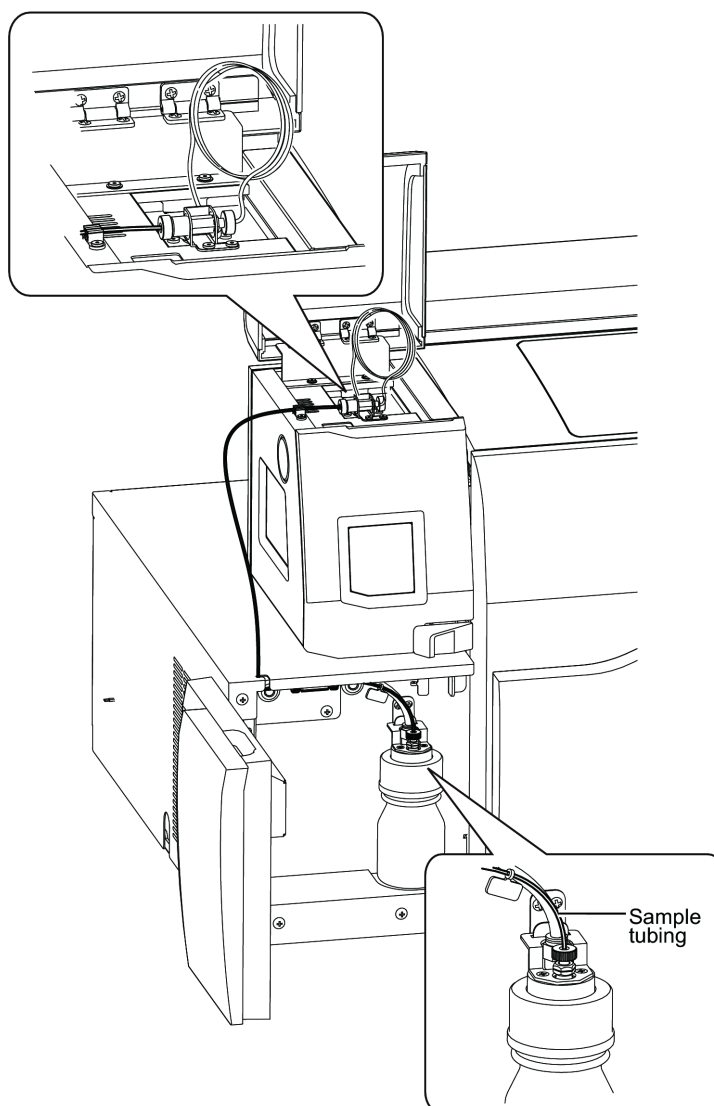


2

Connect the tubing.

- 1 Stop the operation of the LC (pump).
- 2 Disconnect the tube that comes from the LC and connect the resistance tube that is supplied with the instrument from the standard sample bottle to the ESI probe.

NOTE Connect the resistance tube with the red tube on the bottle side. Take care not to bend the resistance tube too much. Maintain a moderate bending radius of at least 40 mm while handling the tube.

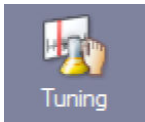
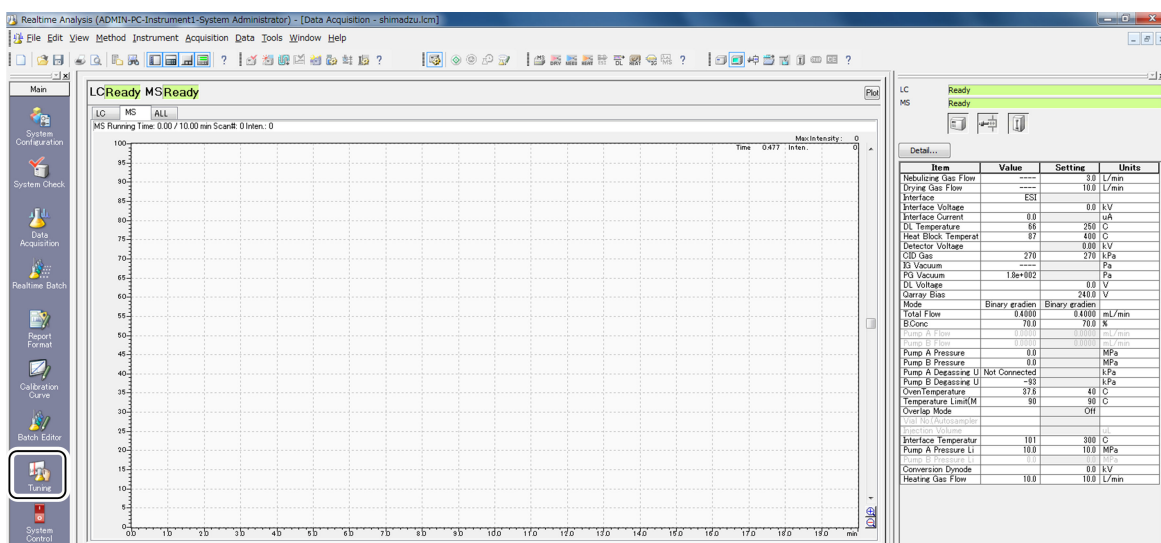
**CAUTION**

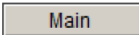
Instruction

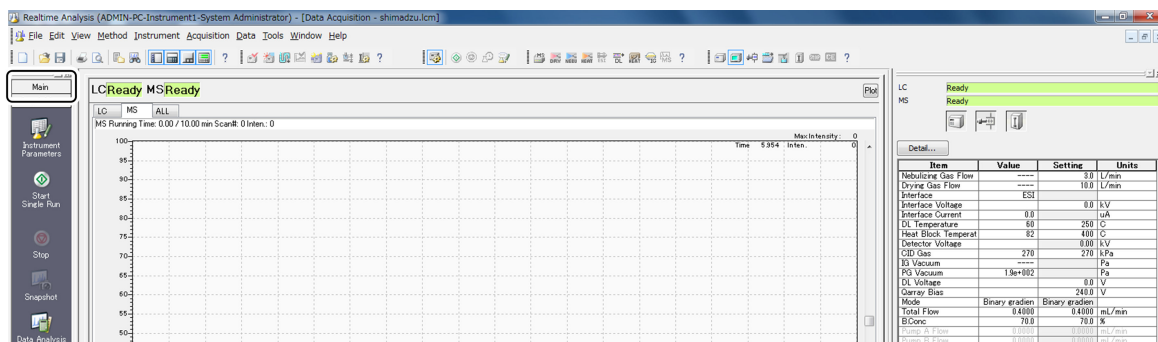
Clean the sample tubing (resistance tube) with methanol after use. Failure to clean the tubing may cause blockages to occur.

3.8.2 Starting Auto Tuning

1 Start up LabSolutions.

2 Click the  (Tuning) icon.

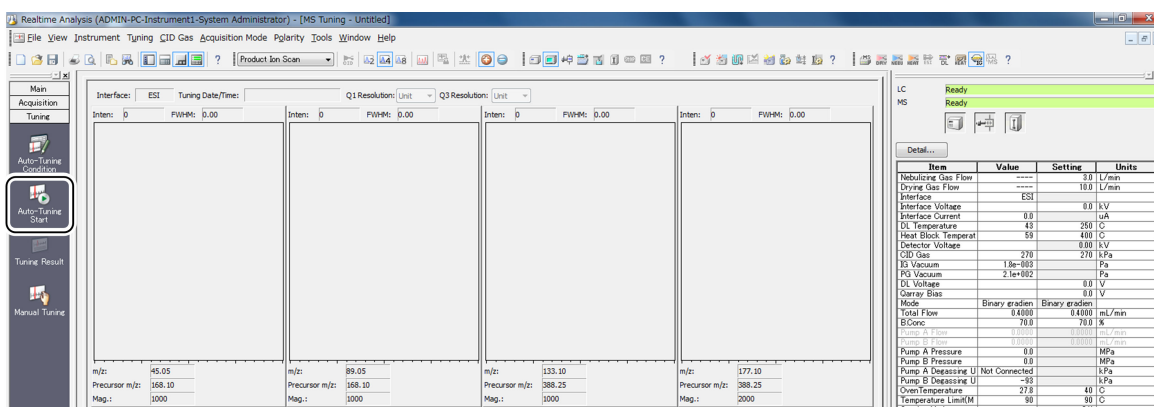
 **Hint** If the [Tuning] icon is not displayed, click  (Main) in the assistant bar.



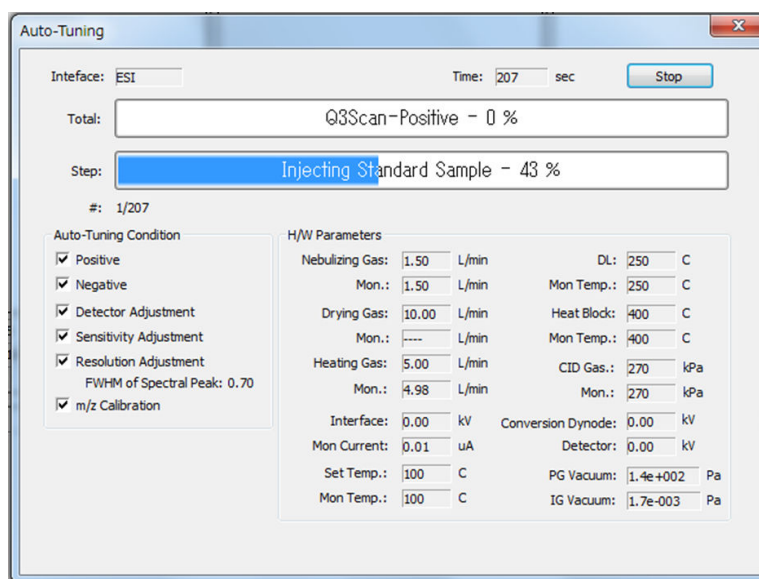
3

Click the  (Autotuning Start) icon.

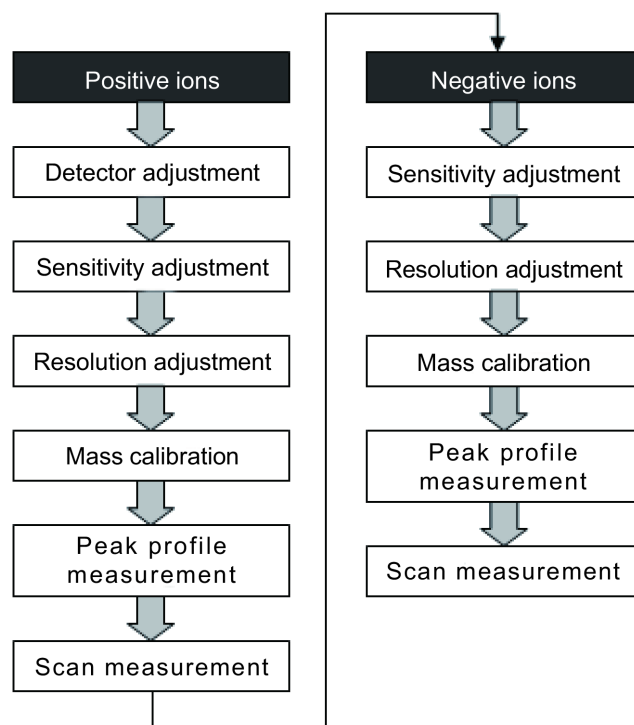
NOTE Make sure that the DL plug has been removed.



Screen shown during the execution of auto tuning



Auto tuning is executed as shown in the figure below according to the analysis mode (Q1, Q3, MS/MS). Auto tuning is completed in about 40 minutes and the results are saved.



■ Detector adjustment

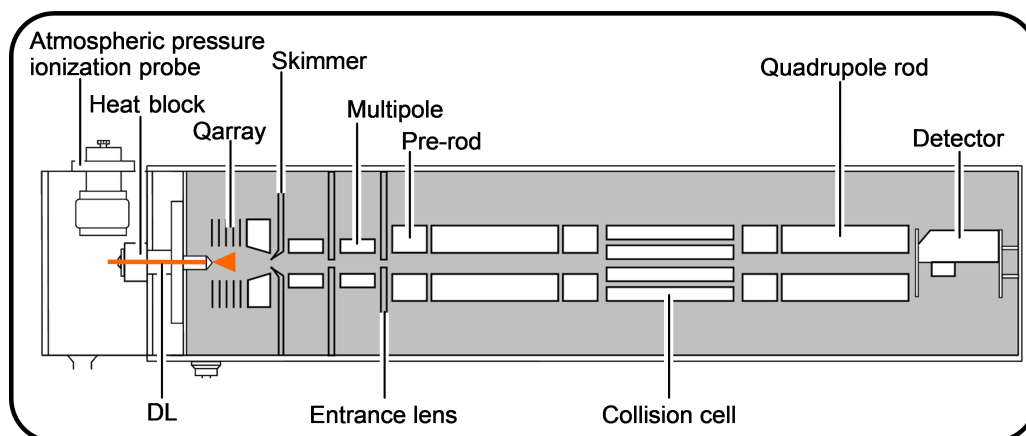
The detector voltage is adjusted automatically.

The same detector voltage is used for all analysis modes.

■ Sensitivity adjustment

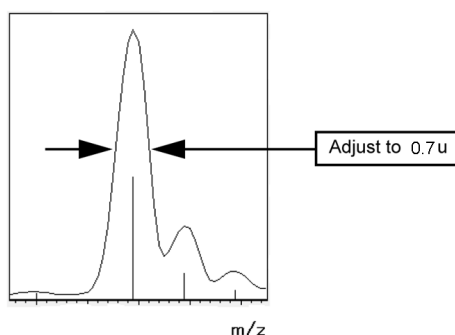
Optimize the lens voltage for each m/z .

Optimize the voltages of the Qarray, multipole and entrance lens for each analysis mode.



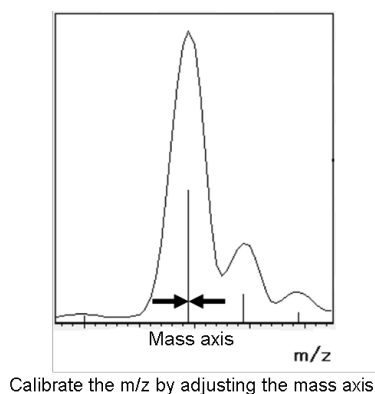
■ Resolution adjustment

Adjust the FWHM of the peak profile to 0.7 u.



■ Mass calibration

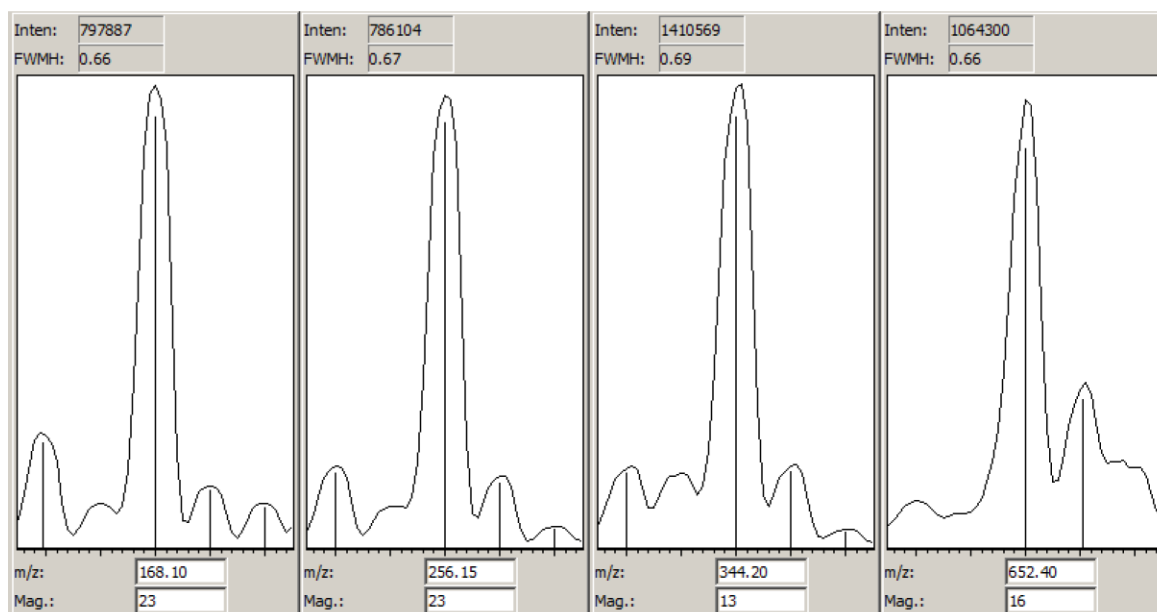
Calibrate the m/z based on the ions in the standard sample.



Calibrate the m/z by adjusting the mass axis

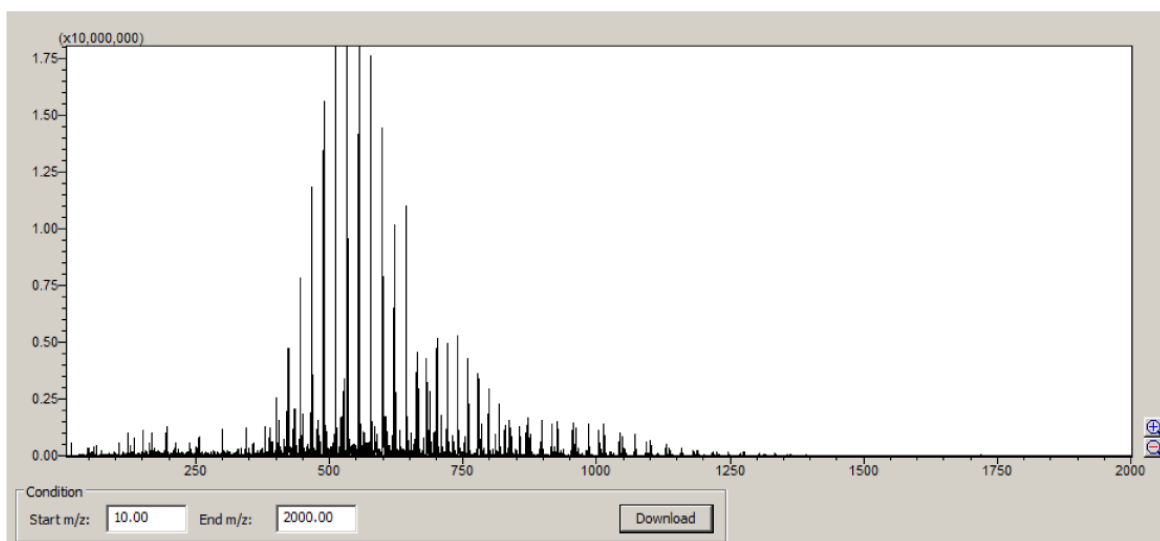
■ Peak profile measurement

Measure the peak profile for displaying tuning results.



■ Scan measurement

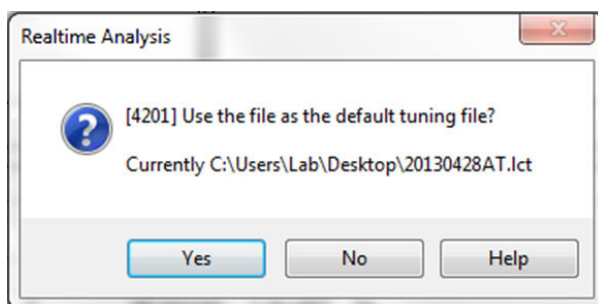
Measure the mass spectrum for displaying tuning results.



4

Save the tuning file.

Select [Save Tuning File As] in the [File] menu and save the tuning file (*.lct). Next, select whether to set the tuning file as the default tuning file.



If [Yes] is selected, the saved tuning file will be set as the default tuning file. The new default tuning file will automatically be displayed from the next time the [Tuning] window is opened. Unless a tuning file to be used is specified at the start of analysis, the default tuning file will automatically be used.

If [No] is selected, the saved tuning file will not be set as the default tuning file, and the existing default tuning file will be displayed when the [Tuning] window is opened.

Results of Auto Tuning

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Sample Information

Sample Type: PEG+PPG+Raffinose

Tuning Condition

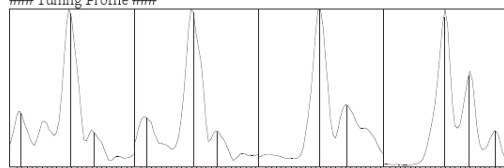
Detector Adjustment: On
 Resolution Adjustment: On
 FWHM of Spectrum: 0.70
 Sensitivity Adjustment: On
 Mass Calibration: On

Tuning Result

Model: LCMS-8050
 Interface: ESI
 Polarity: Pos
 Tuning Mode: Auto
 Tuning Date: 06/03/2013 9:40:31 AM
 Acquisition Mode: Q3 Scan(Use CID Gas)
 Nebulizing Gas Flow: 1.50(settings: 1.50) L/min

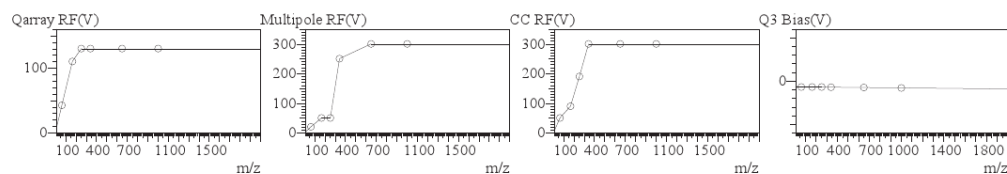
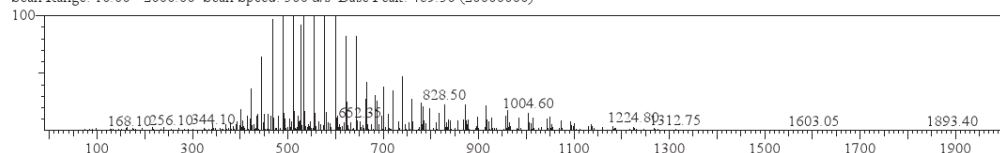
Drying Gas Flow: 0.00(settings: 10.00) L/min
 CID Gas Flow: 270(settings: 270) kPa
 Heating Gas Flow: 5.01(settings: 5.00) L/min
 Interface Bias: +4.00 kV
 Interface Current: 0.68 uA
 Interface Temp.: 100(settings: 350) C
 DL Temp.: 250(settings: 250) C
 Heat Block Temp.: 400(settings: 400) C
 Q1 RF Gain: ---
 Q1 RF Offset: ---
 Q3 RF Gain: 4998
 Q3 RF Offset: 4994
 Q1 Post-rod Bias: -5.0 V
 CID CELL Exit Lens: -1.4 V
 Conversion Dynode: -10.00 kV
 Detector: -1.72(-1.72) kV
 PG Vacuum: 1.3e+002 Pa
 IG Vacuum: 2.3e+003 Pa

Tuning Profile



Int: 217684 FWHM: 0.67 m/z: 256.10 Ref m/z: 256.15 Mag: 89
 Int: 275986 FWHM: 0.76 m/z: 300.10 Ref m/z: 300.20 Mag: 71
 Int: 1553373 FWHM: 0.65 m/z: 652.35 Ref m/z: 652.40 Mag: 12
 Int: 613764 FWHM: 0.59 m/z: 1224.75 Ref m/z: 1224.75 Mag: 30

Scan Range: 10.00 - 2000.00 Scan Speed: 500 u/s Base Peak: 489.30 (20000000)



		Const	65.05	168.10	256.15	344.20	652.40	1004.60
DL Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Qarray Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Qarray RF	Scan	+50.0	+42.6	+110.0	+130.0	+130.0	+130.0	+130.0
Multipole RF	Scan	+100.0	+20.0	+50.0	+50.0	+250.0	+300.0	+300.0
Multipole1 Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Multipole1 Lens	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Multipole2 Bias	Const	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Multipole2 Lens	Const	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
Q1 Bias	Const	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
CC Lens1	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
CC Lens2	Const	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0
CC Lens3	Const	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
		Const	65.05	168.10	256.15	344.20	652.40	1004.60
CC RF	Scan	+200.0	+50.0	+90.0	+190.0	+300.0	+300.0	+300.0
CE	Scan	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
Q3 Bias	Scan	-7.0	-7.0	-7.0	-7.1	-7.2	-7.6	-8.0
		Const	107.15	1071.50				
Q1 Pre Bias	Scan	-15.0	-5.0	-50.0				
Q3 Pre Bias	Scan	-15.0	-5.0	-50.0				

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3 Preparation

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Sample Information ####
Sample Type: PEG+PPG+Raffinose

Tuning Condition

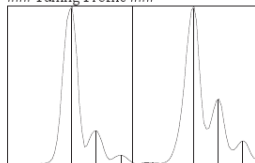
Detector Adjustment: On
Resolution Adjustment: On
FWHM of Spectrum: 0.70
Sensitivity Adjustment: On
Mass Calibration: On

Tuning Result

Model: LCMS-8050
Interface: ESI
Polarity: Neg
Tuning Mode: Auto
Tuning Date: 06/03/2013 9:46:09 AM
Acquisition Mode: Q3 Scan(Use CID Gas)
Nebulizing Gas Flow: 1.50(settings : 1.50) L/min

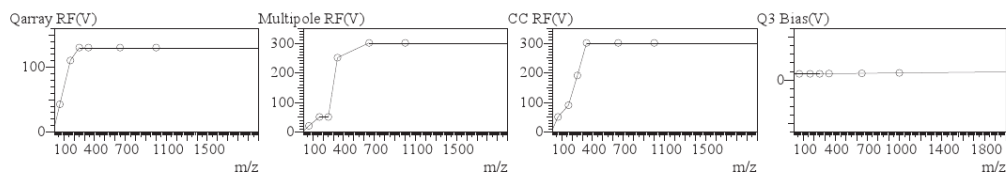
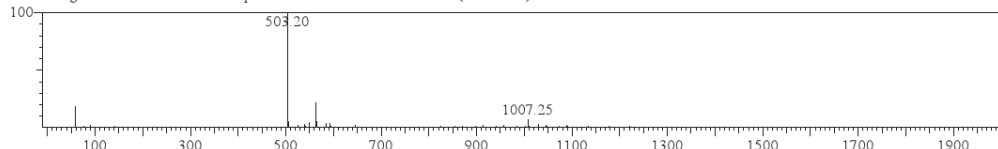
Drying Gas Flow: 0.00(settings : 10.00) L/min
CID Gas Flow: 270(settings : 270) kPa
Heating Gas Flow: 5.01(settings : 5.00) L/min
Interface Bias: -3.00 kV
Interface Current: 0.39 uA
Interface Temp.: 100(settings : 350) C
DL Temp.: 250(settings : 250) C
Heat Block Temp.: 400(settings : 400) C
Q1 RF Gain: ---
Q1 RF Offset: ---
Q3 RF Gain: 4998
Q3 RF Offset: 5002
Q1 Post-rod Bias: 5.0 V
CID CELL Exit Lens: 3.5 V
Conversion Dynode: +10.00 kV
Detector: -1.72(-1.57) kV
PG Vacuum: 1.3e+002 Pa
IG Vacuum: 2.3e-003 Pa

Tuning Profile



Int: 18798048 Int: 1381090
FWHM: 0.67 FWHM: 0.67
m/z: 503.20 m/z: 1007.25
Ref m/z: 503.15 Ref m/z: 1007.30
Mag: 1 Mag: 14

Scan Range: 10.00 - 2000.00 Scan Speed: 500 u/s Base Peak: 503.20 (18543799)



		Const	65.05	168.10	256.15	344.20	652.40	1004.60
DL Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Qarray Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Qarray RF	Scan	+50.0	+42.6	+110.0	+130.0	+130.0	+130.0	+130.0
Multipole RF	Scan	+100.0	+20.0	+50.0	+50.0	+250.0	+300.0	+300.0
Multipole1 Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Multipole1 Lens	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Multipole2 Bias	Const	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4
Multipole2 Lens	Const	+2.6	+2.6	+2.6	+2.6	+2.6	+2.6	+2.6
Q1 Bias	Const	+3.5	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0
CC Lens1	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
CC Lens2	Const	+100.0	+100.0	+100.0	+100.0	+100.0	+100.0	+100.0
CC Lens3	Const	+20.0	+20.0	+20.0	+20.0	+20.0	+20.0	+20.0
		Const	65.05	168.10	256.15	344.20	652.40	1004.60
CC RF	Scan	+200.0	+50.0	+90.0	+190.0	+300.0	+300.0	+300.0
CE	Scan	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0
Q3 Bias	Scan	+7.0	+7.0	+7.0	+7.1	+7.2	+7.6	+8.0
		Const	107.15	1071.50				
Q1 Pre Bias	Scan	+15.0	+5.0	+50.0				
Q3 Pre Bias	Scan	+15.0	+5.0	+50.0				

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Sample Information

Sample Type: PEG+PPG+Raffinose

Tuning Condition

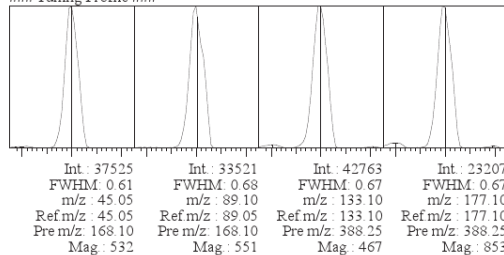
Detector Adjustment: On
 Resolution Adjustment: On
 FWHM of Spectrum: 0.70
 Sensitivity Adjustment: On
 Mass Calibration: On

Tuning Result

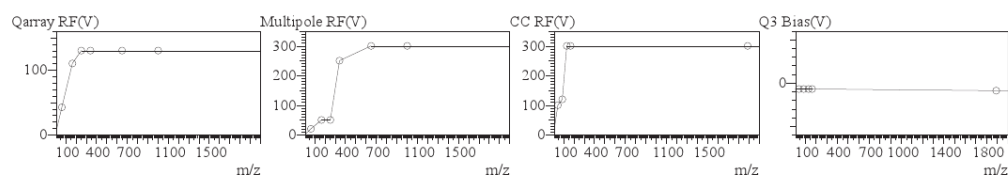
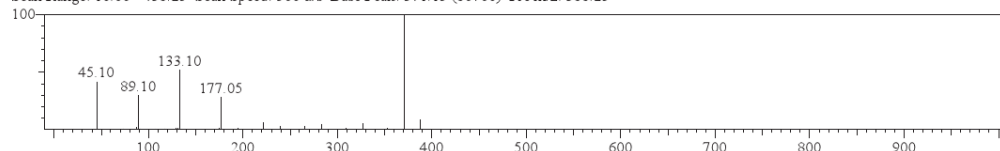
Model: LCMS-8050
 Interface: ESI
 Polarity: Pos
 Tuning Mode: Auto
 Tuning Date: 06/03/2013 9:56:52 AM
 Acquisition Mode: Product Scan
 Nebulizing Gas Flow: 1.50(settings : 1.50) L/min

Drying Gas Flow: 0.00(settings : 10.00) L/min
 CID Gas Flow: 270(settings : 270) kPa
 Heating Gas Flow: 5.01(settings : 5.00) L/min
 Interface Bias: +4.00 kV
 Interface Current: 0.66 uA
 Interface Temp.: 100(settings : 350) C
 DL Temp.: 250(settings : 250) C
 Heat Block Temp.: 400(settings : 400) C
 Q1 RF Gain: 4999
 Q1 RF Offset: 5000
 Q3 RF Gain: 4998
 Q3 RF Offset: 4999
 Q1 Post-rod Bias: -5.0 V
 CID CELL Exit Lens: -3.8 V
 Conversion Dynode: -10.00 kV
 Detector: -1.72(-1.72) kV
 PG Vacuum: 1.2e+002 Pa
 IG Vacuum: 2.3e-003 Pa

Tuning Profile



Scan Range: 10.00 - 438.25 Scan Speed: 500 u/s Base Peak: 371.15 (80700) Pre m/z: 388.25



		Const	65.05	168.10	256.15	344.20	652.40	1004.60
DL Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Qarray Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Qarray RF	Scan	+50.0	+42.6	+110.0	+130.0	+130.0	+130.0	+130.0
Multipole RF	Scan	+100.0	+20.0	+50.0	+50.0	+250.0	+300.0	+300.0
Multipole1 Bias	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Multipole1 Lens	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
Multipole2 Bias	Const	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Multipole2 Lens	Const	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
Q1 Bias	Const	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
CC Lens1	Const	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0	+0.0
CC Lens2	Const	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0
CC Lens3	Const	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
		Const	45.05	89.05	133.10	168.10	1893.40	
CC RF	Scan	+100.0	+100.0	+120.0	+300.0	+300.0	+300.0	
CE	Scan	-20.0	-25.0	-15.0	-15.0	-15.0	-15.0	
Q3 Bias	Scan	-7.0	-7.0	-7.0	-7.0	-7.0	-9.0	
		Const	107.15	1071.50				
Q1 Pre Bias	Scan	-15.0	-5.0	-50.0				
Q3 Pre Bias	Scan	-15.0	-5.0	-50.0				

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Interpreting tuning results

A detector voltage of about -1.6 to -3.0 kV is normal.

The detector deteriorates and the detector voltage increases at a rate that depends on its conditions of use. You may need to replace the detector around every two years.

As a guide, it should be replaced when the auto tuning result reaches about -2.7 kV.

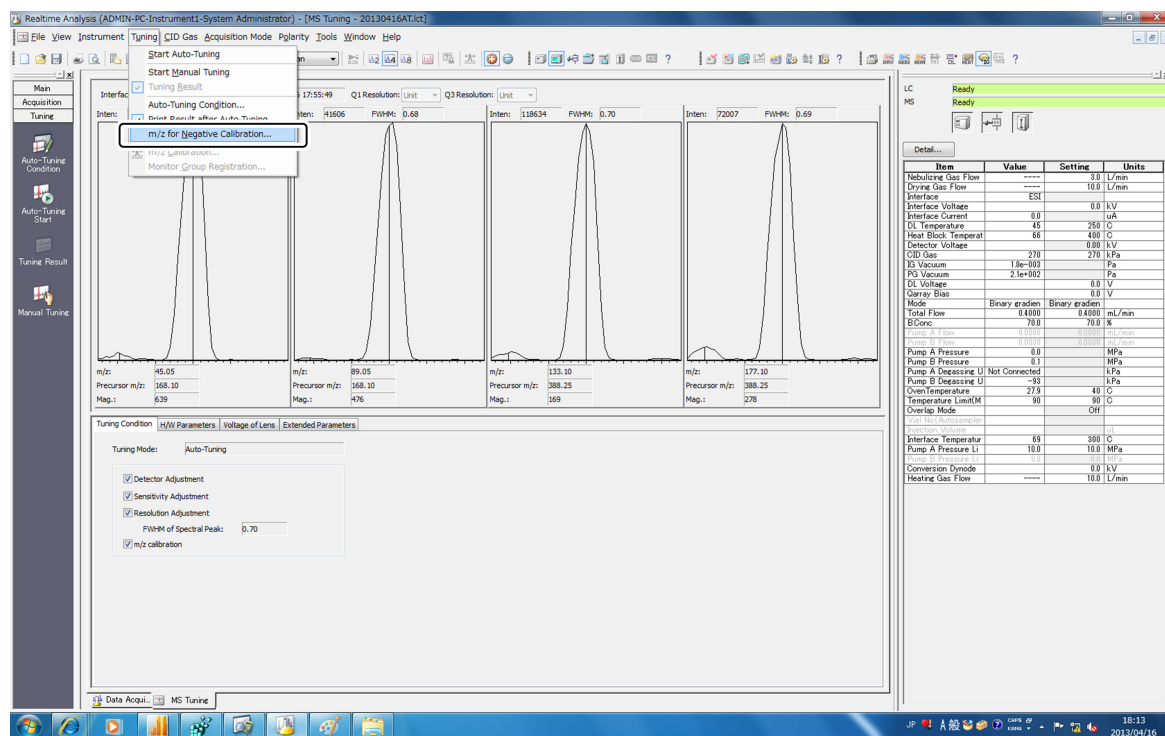
The PG (Pirani gauge) indicates the pressure of the interface unit.

Normally, this is about 130 Pa. If it is lower than 40 Pa, check that the DL is not sealed with a DL plug.

If a DL plug is not present, the DL is most likely clogged. In this case, replace the DL.

►► Reference "7.9 Replacing the DL" P.176

NOTE In negative tuning, the sensitivity of the raffinose peak used for mass calibration can drop substantially depending on the type of mobile phase. This is due to the fact that mobile phase derivatives are added to the raffinose. If this happens, the mass used for mass calibration has to be changed. Check the negative ions that are observed in "8.2 Manual Tuning" and enter the mass to be used for mass calibration.



CAUTION



Prohibition

When implementing regular auto tuning normally, do NOT change the mass used for mass calibration.

Typical example

	MS	MS/MS
When acetic acid is contained in the mobile phase	Low m/z: 119.05 High m/z: 563.20	Precursor of m/z: 563.20 Product of m/z: 179.05 Losses of: 384.15
When TFA (trifluoroacetic acid) is contained in the mobile phase	Low m/z: 227.00 High m/z: 617.15	Precursor of m/z: 617.15 Product of m/z: 113.00 Losses of: 504.15

Edit Mz for Negative Calibration

MS

Low m/z (m/z: 503.15) 227.00

High m/z (m/z: 1007.30) 617.15

MS/MS

Precursor of m/z (m/z: 503.15) 617.15

Product of m/z (m/z: 179.05) 113.00

Losses of (m/z: 414.15) 504.15

OK Cancel Initialize Help

4 Basic Operation

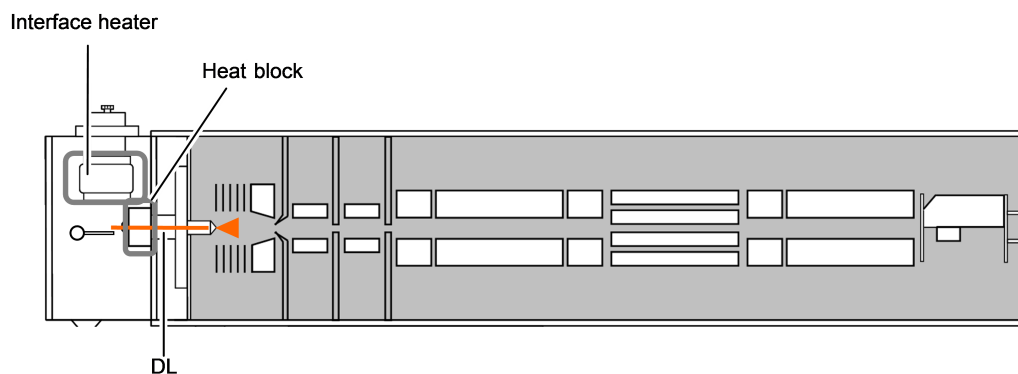
This chapter explains the operations for turning the instrument's high voltage, heater, gas, and MS operation ON and OFF.

For information on data acquisition, refer to the LabSolutions Getting Started Guide and Operators Guide, or refer to the operation manual.

4.1 Heater ON/OFF Status and Temperature Monitor

To ensure safety, turn the heater OFF and check that the temperature of all units has fallen below 50 °C before starting maintenance work on the instrument.

Turn the interface heater, heat block and DL OFF.



1

Start up LabSolutions.

Click the ON/OFF buttons for each of the heaters to turn the heaters ON or OFF.

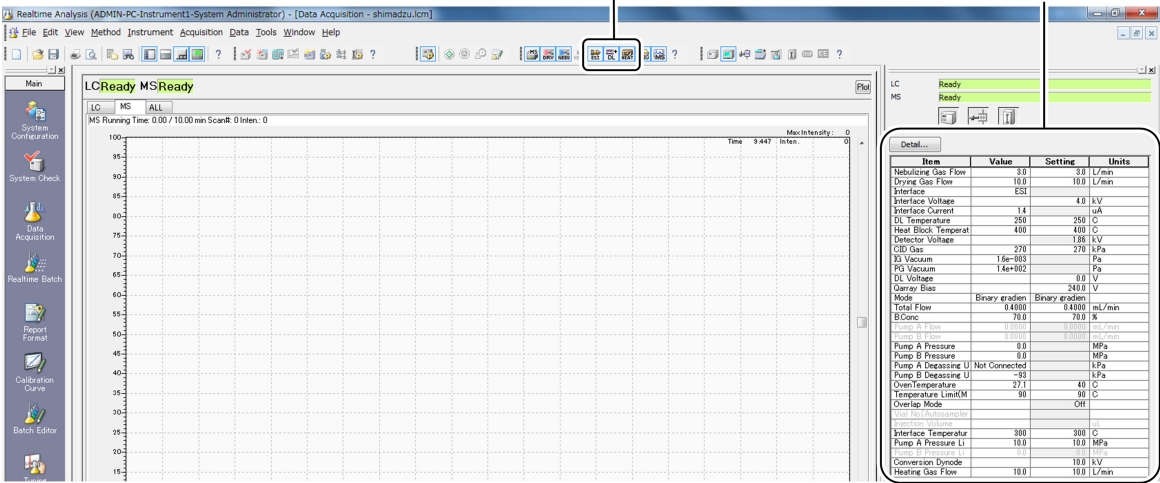
NOTE Always turn the heating gas ON before turning the interface heater ON.

Button	ON	OFF
DL		
Heat block		
Interface heater (ESI, DUIS)		
Interface heater (APCI)		



Heater ON/OFF button

Instrument monitor



2

Check the temperature in the instrument monitor panel.

▶▶ Reference For initial values, see "8.2.3 Explanations of Parameters" P.229.

Item	Value	Setting	Units
Nebulizing Gas Flow	5.0	5.0	L/min
Drying Gas Flow	10.0	10.0	L/min
Interface	ESI		
Interface Voltage		4.0	kV
Interface Current	1.4		μA
DL Temperature	250	250	C
Heat Block Temperature	400	400	C
Detector voltage		1.00	kV
CID Gas	270	270	kPa
IG Vacuum	1.6e-003		Pa
PG Vacuum	1.4e+002		Pa
DL Voltage		0.0	V
Qarray Bias		240.0	V
Mode	Binary gradient	Binary gradient	
Total Flow	0.4000	0.4000	mL/min
B.Conc	70.0	70.0	%
Pump A Flow	0.0000	0.0000	mL/min
Pump B Flow	0.0000	0.0000	mL/min
Pump A Pressure	0.0		MPa
Pump B Pressure	0.0		MPa
Pump A Degassing U	Not Connected		kPa
Pump B Degassing U	-93		kPa
Oven Temperature	27.1	40	C
Temperature Limit(M	90	90	C
Overlap Mode		Off	
Vial No(Autosampler			
Injection Volume			μl
Interface Temperature	300	300	C
Pump A Pressure Li	10.0	10.0	MPa
Pump B Pressure Li	0.0	0.0	MPa
Conversion Dynode		10.0	kV
Heating Gas Flow	10.0	10.0	L/min

Monitor value (temperature)

Set value (temperature)

DL

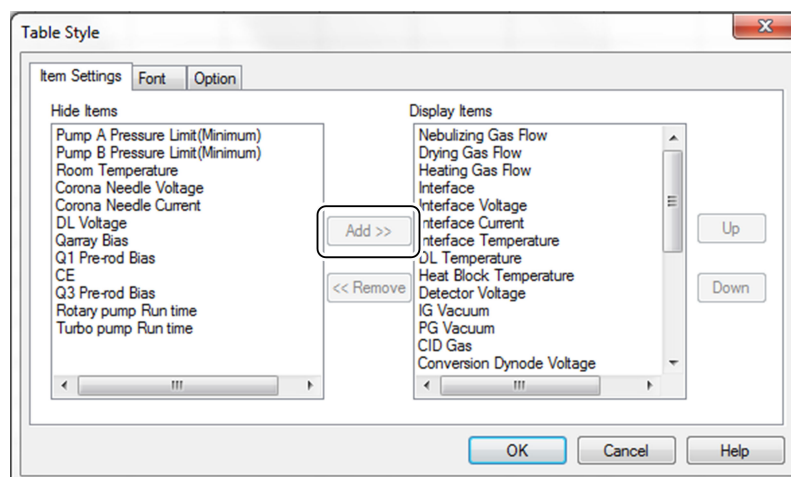
Heat block

Interface heater



Hint

- If the instrument monitor panel is not displayed, display it by selecting [View] - [Instrument Monitor].
- If the heater temperature is not displayed in the instrument monitor panel: Right click on the instrument monitor panel to display the [Table Style] window. Select the desired items from the [Hide Items] list and click [Add >>].

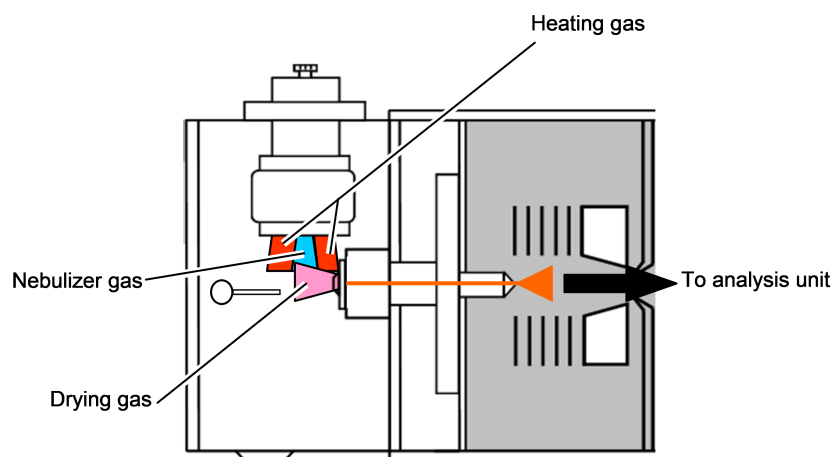


4.2 Gas ON/OFF Status and Flow Rate Monitor

The LCMS-8050 uses nebulizer gas, drying gas, and heating gas.

To ensure safety, turn the gas OFF before starting maintenance work on the instrument.

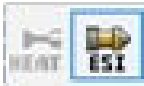
Turn the gas OFF by clicking the buttons indicated below.



1

Start up LabSolutions.

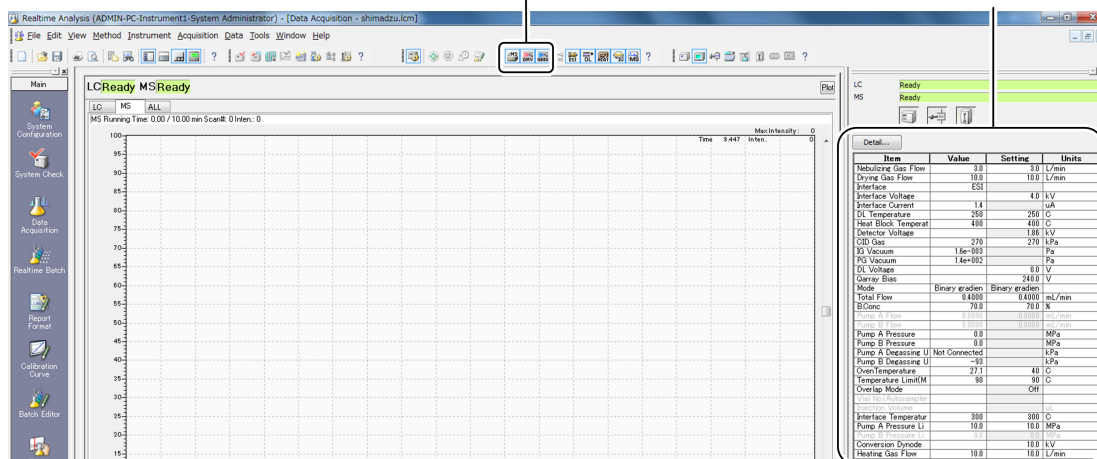
Click the ON/OFF buttons for each gas to turn the gas ON or OFF.

Button	ON	OFF
Nebulizer gas		
Drying gas		
Heating gas	(Gas ON) 	
	(Gas and interface heater ON) 	



Gas ON/OFF button

Instrument monitor



2

Check the flow rate in the instrument monitor panel.

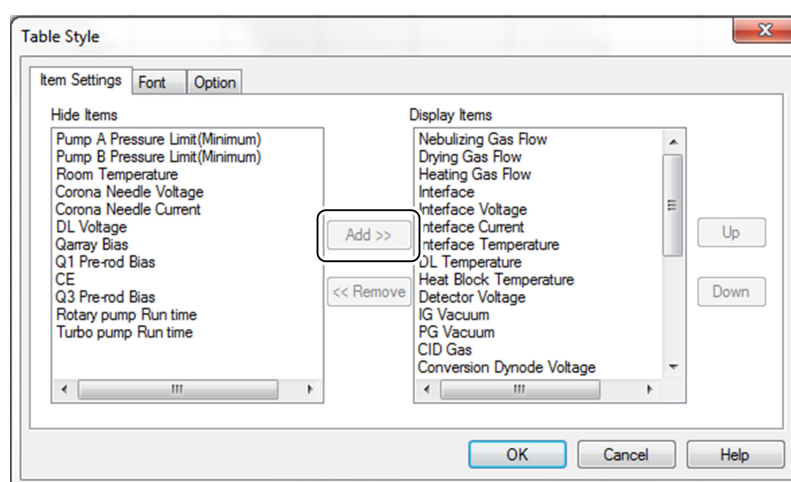
▶▶ Reference For initial values, see "8.2.3 Explanations of Parameters" P.229.

Item	Value	Setting	Units	
Nebulizing Gas Flow	3.0	3.0	L/min	Nebulizing gas
Drying Gas Flow	10.0	10.0	L/min	Drying gas
Interface	ESI			
Interface Voltage		4.0	kV	
Interface Current	1.4		uA	
DL Temperature	250	250	°C	
Heat Block Temperature	400	400	°C	
Detector Voltage		1.86	kV	
CID Gas	270	270	kPa	
IG Vacuum	1.6e-003		Pa	
PG Vacuum	1.4e+002		Pa	
DL Voltage		0.0	V	
Qarray Bias		240.0	V	
Mode	Binary gradient	Binary gradient		
Total Flow	0.4000	0.4000	mL/min	
B.Conc	70.0	70.0	%	
Pump A Flow	0.0000	0.0000	mL/min	
Pump B Flow	0.0000	0.0000	mL/min	
Pump A Pressure	0.0		MPa	
Pump B Pressure	0.0		MPa	
Pump A Degassing U	Not Connected		kPa	
Pump B Degassing U	-93		kPa	
Oven Temperature	27.1	40	°C	
Temperature Limit(M	90	90	°C	
Overlap Mode		Off		
Vial No(Autosampler				
Injection Volume			uL	
Interface Temperature	300	300	°C	
Pump A Pressure Li	10.0	10.0	MPa	
Pump B Pressure Li	0.0	0.0	MPa	
Conversion Dynode		10.0	kV	
Heating Gas Flow	10.0	10.0	L/min	Heating gas



Hint

- If the instrument monitor panel is not displayed, display it by selecting [View] - [Instrument Monitor].
- If the gas flow rate is not displayed in the instrument monitor panel: Right click on the instrument monitor panel to display the [Table Style] window. Select the desired items from the [Hide Items] list and click [Add >>].



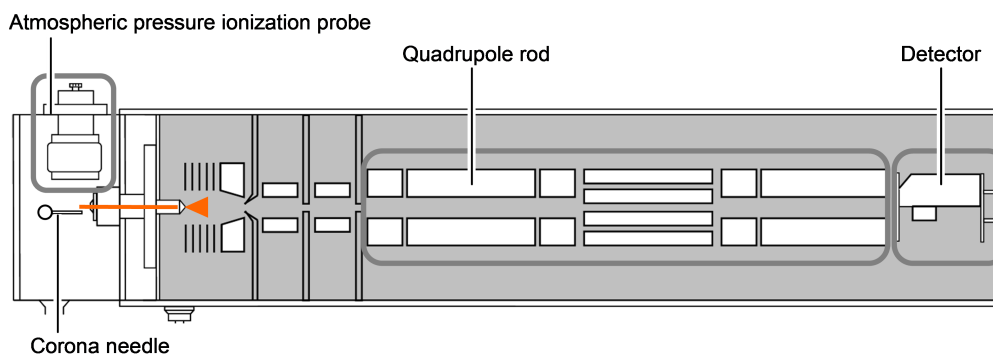
NOTE

Even after the interface heater has been turned OFF, the heating gas will remain ON until the interface heater cools down below the specified temperature.

4.3 Turning the High Voltage ON/OFF

To ensure safety, turn the high voltage OFF before starting maintenance work on the instrument.

Turn OFF the atmospheric pressure ionization probe, corona needle, quadrupole and detector voltage by clicking the [MS detector] button in LabSolutions. The detector voltage cannot be turned ON when the nebulizer gas is OFF.

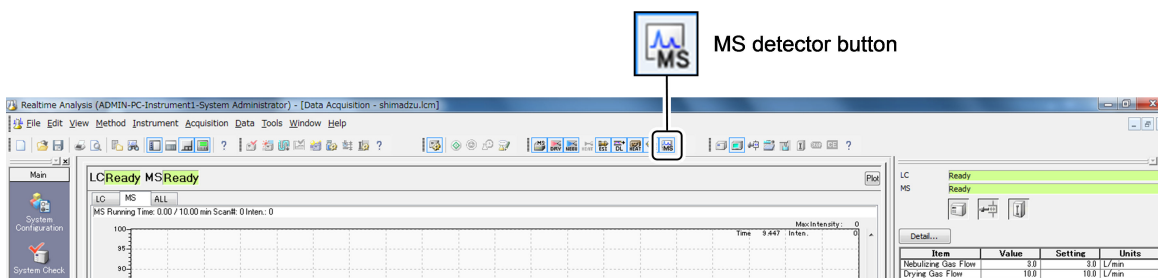


1

Start up LabSolutions.

Click [MS detector] button to turn the high voltage ON or OFF.

Button	High Voltage ON	High Voltage OFF
MS detector		



4.4 Turning the MS Operation ON/OFF

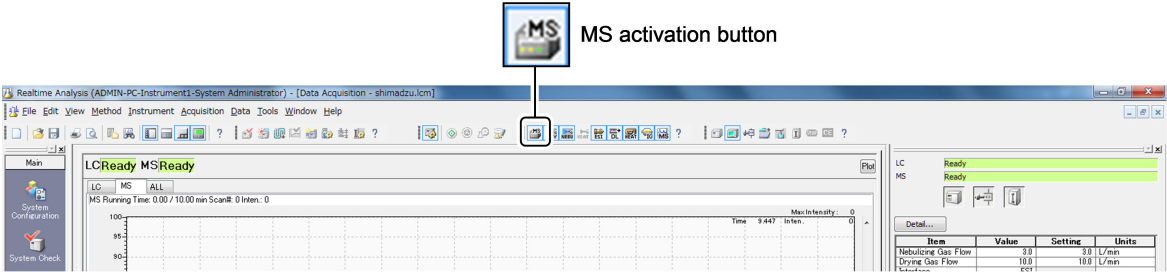
Pressing the MS operation button allows ON/OFF operation of gases, heaters, ion gauge (vacuum gauge), and MS detector all at once.

This feature is useful for controlling the instrument during startup, shutdown, and maintenance.

1

Start up LabSolutions.

Button	MS Operation ON	MS Operation OFF
MS operation button		



5 Analysis Modes

The LCMS-8050 is an analysis instrument that combines two quadrupole mass filters in order to obtain all kinds of mass spectra.

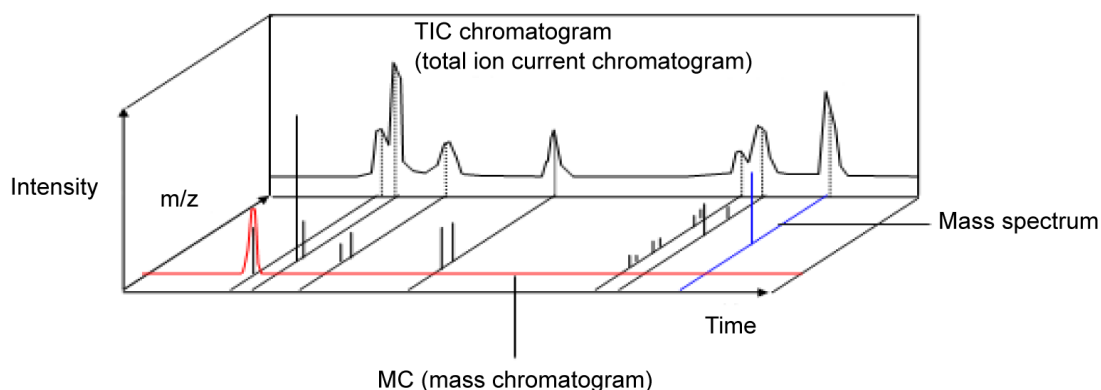
Needless to say, MS analysis is possible in addition to MS/MS analysis using the analysis mode of each quadrupole mass filter.

5.1 MS Analysis

MS analysis is possible using either Q1 or Q3 in the MS analysis mode.

Analysis Mode	Q1	Collision Cell	Q3
Q1 MS	Resolution mode	Ion guide mode	
Q3 MS	Ion guide mode		Resolution mode

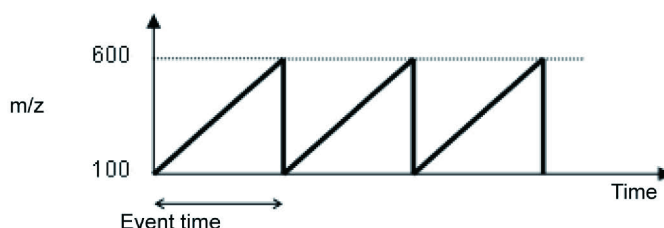
5.2 MS Scan Mode



Scan measurement is a method in which measurement is performed while scanning the mass range once every fixed interval (at the sampling rate). (I.e., a mass spectrum is obtained once every fixed interval.)

This method is mainly used for qualitative analysis.

Let's take the example of scanning from m/z 100 to 600:



As shown in the figure above, the m/z range is scanned.

If we make the scan time 1 second, this means that the range from m/z 100 to 600, which is an interval of 500, is scanned in 1 second.

This is called a scan speed of 500 u/sec.

The LCMS-8050 is capable of scan measurement at a maximum speed of 30,000 u/sec in Q3 MS mode. When performing high speed scan measurement, use Q3 MS mode as opposed to Q1 MS mode.

- TIC chromatogram (total ion current chromatogram)
A TIC chromatogram is a chromatogram that is displayed using all of the detected ions.
- MC (mass chromatogram)
This is a chromatogram that shows the change in the intensity of m/z over time for a selected ion with a specific mass.

5.3 SIM Mode

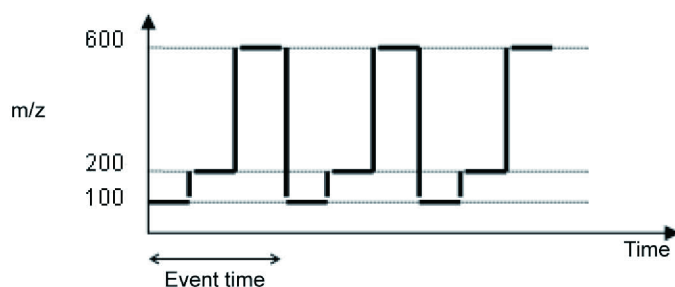
In scan measurement a mass spectrum is obtained continually. SIM is a method in which only ions with the target mass are selectively detected. Compared with scan measurement it enables high-sensitivity analysis with no detection time wasted on the detection of ions with masses that are not required.

Since the peak height and area are stable too, SIM is normally used for quantitative analysis.

An example where m/z 100, 200 and 600 are analyzed using SIM is shown below.

Up to 32 channels can be set for a single event.

1,000 events can be configured. (3 channels are set in the example below.)



5.4 MS/MS Analysis Mode

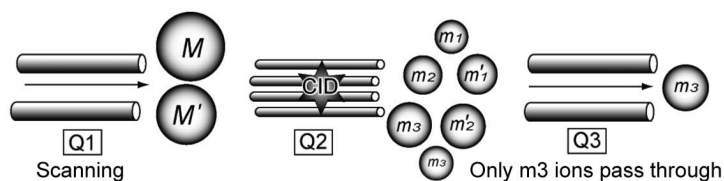
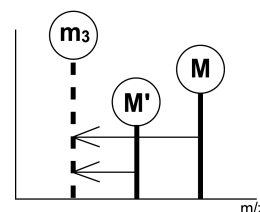
Specific ions are selected in the first quadrupole mass filter (Q1) in MS/MS analysis mode. These selected ions are referred to as precursor ions. The precursor ions are collided with inert gas in the collision cell (collision-induced dissociation, CID) to generate product ions. By measuring the product ions in the second quadrupole mass filter (Q3), we can obtain information regarding the structure of the precursor ions. This analysis method is referred to as MS/MS. Four types of analysis are possible by configuring either scan analysis or SIM analysis for Q1 and Q3.

Analysis Mode	Q1	Collision Cell	Q3
Precursor ion scan	Scan	Ion guide mode	SIM
Product ion scan	SIM		Scan
Neutral loss scan	Scan		Scan
MRM	SIM		SIM

5.5 Precursor Ion Scan Mode

The analysis method in this mode involves performing scanning in Q1, fixing Q3 to a specific m/z , and selectively analyzing the ions generated in the CID. This allows the examination of precursor ions with common product ions. This mode is suitable for screening ions with common substructures.

The horizontal axis of the displayed mass spectrum indicates the scale of Q1 and the vertical axis indicates the intensity of the product ions.



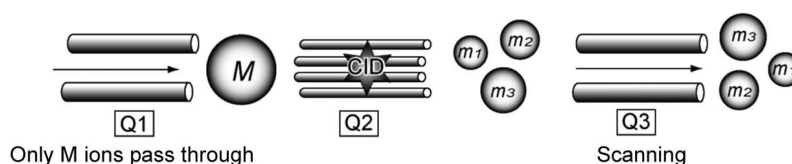
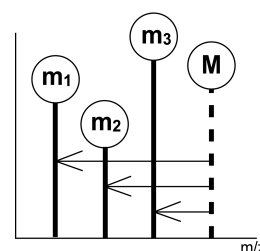
Precursor Ion Mode Pattern Diagram

5.6 Product Ion Scan Mode

The analysis method in this mode involves fixing Q1 to a specific m/z and performing selective analysis on precursor ions selected in Q3 that were generated in the CID. As product ion spectra can be obtained, this mode is suitable for examining the structure of ions selected in Q1. The horizontal axis of the displayed mass spectrum indicates the scale of Q3.

Example of usage:

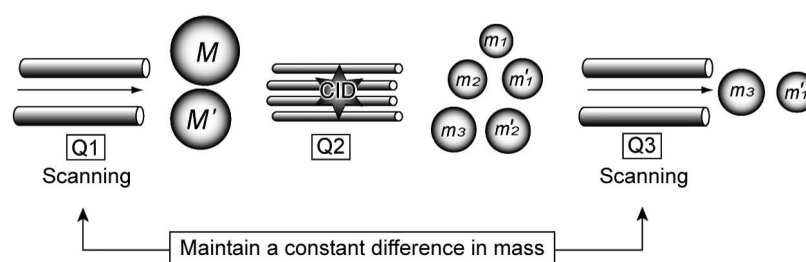
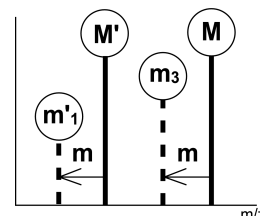
MRM analysis condition examination - Product ion identification
Determining the amino-acid sequence of peptides and proteins



Product Ion Mode Pattern Diagram

5.7 Neutral Loss Scan Mode

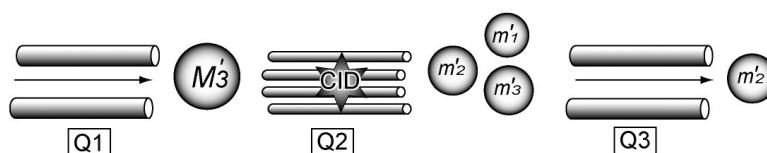
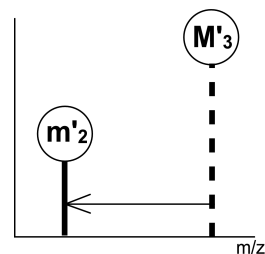
The analysis method in this mode involves maintaining the difference in the m/z for analysis in Q1 and Q3 while performing scan analysis. This allows the scanning of ions desorbed from common neutral fragments. As with the precursor ion scan mode, this mode is suitable for screening ions with common substructures (neutral fragments). Generally, the horizontal axis of the displayed spectrum indicates the scale of Q1 and the vertical axis indicates the intensity of the product ions.



Neutral Loss Mode Pattern Diagram

5.8 MRM Mode

The analysis method in this mode involves fixing both Q1 and Q3 to a specific m/z and selectively analyzing ions. Precursor ions are selected in Q1 and product ions that contain structural information generated in the CID are selected in Q3. As both precursor ions and product ions are specified and monitored, highly selective quantitative analysis that is low in unwanted substances can be achieved compared to SIM measurement. This means this mode is effective in determining the quantities of trace constituents contained in large matrix samples. Only chromatograms can be obtained in MRM mode as scanning is not performed.



MRM (Multiple Reaction Monitoring)

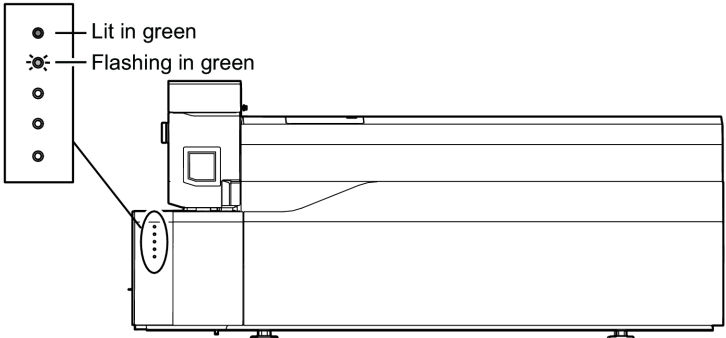
6 Troubleshooting

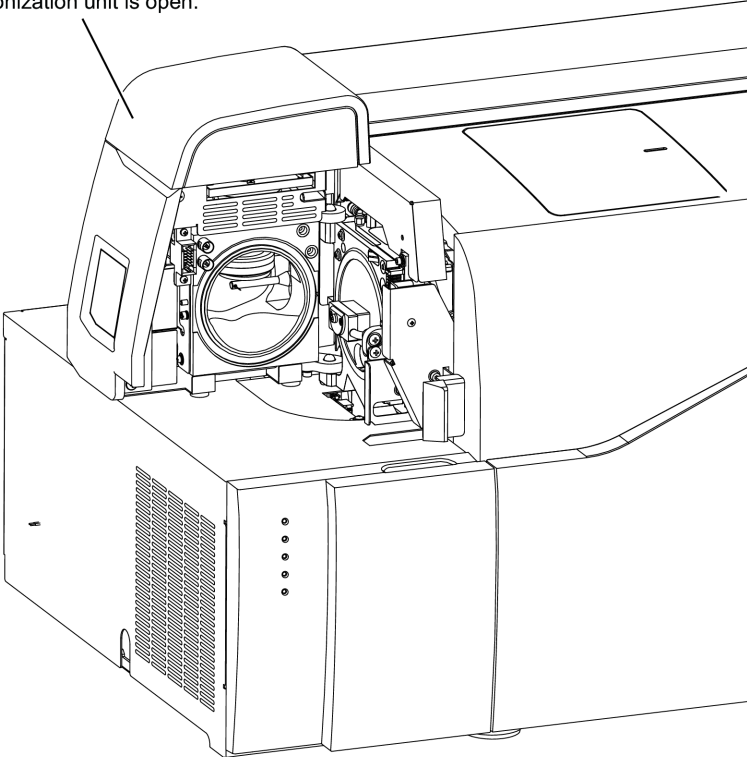
6.1 Fault Diagnosis and Corrective Actions

This chapter describes the causes of problems and the corrective action to take when they occur. For more details on the action to take, refer to the reference pages cited in the tables below.

If the problem is not resolved after taking the corrective action described here, or if the fault is considered to be one not described here, contact your Shimadzu representative.

6.1.1 General

Problem	Cause / Corrective Action / See
The LEDs (POWER) do not light when the power is turned ON.	Check if the power cable is correctly connected and if single-phase 230 V power is being supplied to the distribution panel. ▶▶ Reference "8.1.2 Connecting the Instrument" P.206 Status immediately after turning the power ON POWER STATUS HEATES GAS HV ● Lit in green ◐ Flashing in green ○ ○ ○ 
The instrument does not connect.	Check the connection of the USB cable. ▶▶ Reference "2.2 Names of Parts" P.15 After checking that the power to the instrument (MS, LC) is ON, restart the PC. Check the environment settings in LabSolutions.

Problem	Cause / Corrective Action / See
The detector and heater cannot be turned ON. If they are set to ON they immediately turn back OFF again.	The vacuum system is not operating normally. If the vacuum system is not in the "ready" status the MS detector and heater cannot be turned ON. An interlock has been actuated. Interlock functions operate as a measure to prevent danger when people are working. If the condition indicated in the figure below applies, the MS detector (high voltage) and heater are turned OFF. The ionization unit is open. 
The instrument stops and the "STATUS" LED lights in red.	When an abnormality of the vacuum system has been detected, the instrument is automatically stopped by a protective function. The probable causes are as follows. • A large vacuum leak • An abnormality of the vacuum pump (rotary pump, triple inlet turbo molecular pump) • An abnormality of the leak valve If this happens, temporarily exit LabSolutions and turn OFF the power to the PC and MS. Checking for vacuum leaks and, after effecting repairs (see "7.12 Vacuum Leak Check" P.193), turn the power to the MS back ON, then turn the power to the PC ON and start up LabSolutions.

Problem	Cause / Corrective Action / See
The "STATUS" LED is flashing in green.	When the triple inlet turbo molecular pump is still in preparation, or the degree of vacuum has not reached the target value, the LED flashes in green. The LED flashes in green when in standby mode. ■ NOTE - When starting and stopping the instrument, except when it is started other than by an automatic start (i.e., manually), the ion gauge has to be set to ON. - When the instrument has been stopped for a long time it takes some time to evacuate it and the "Ready" status may not be reached within the prescribed time. In this case the "STATUS" LED on the front of the instrument will continue to flash in green, but this does not indicate an abnormality. When the pressure has dropped the "Ready" status will be attained and the "STATUS" LED will light in green. If the ion gauge cannot be turned ON, or if the ion gauge is turned on but the "STATUS" LED continues to flash in green for longer than three hours, there could be a vacuum leak. Take appropriate action by referring to "7.12 Vacuum Leak Check" P.193.
The "STATUS" LED is flashing in green and the LabSolutions screen indicates standby status.	The DL is not mounted. Mount the DL.
	The DL connector is disconnected. See "7.9 Replacing the DL" P.176 and check that the DL connector is connected properly.
	Check the Pirani gauge value on the instrument status. If the value is more than 300 Pa, perform the procedure described in "7.12 Vacuum Leak Check" P.193 .
The buzzer is sounding.	Check the cause of the error, which will be displayed on the LabSolutions screen.
The buzzer sounds in the pattern "pip pipee pip pipee" (sounding twice per second).	A liquid leakage has been detected at the leak tray inside the instrument's front door. When a liquid leakage error occurs, analysis is stopped. Eliminate the cause of the liquid leakage.
The buzzer sounds in the pattern "pip pip pip pip" (sounding four times per second).	This indicates overheating of the DL, interface heater, and heat block. The heater is turned OFF automatically. This indicates that, as the result of some abnormality, the temperature of any part of the DL, heat block or interface heater, has risen to the upper limit value for heat resistance. When the upper limit temperature is reached the heaters are automatically turned OFF; once the temperature has fallen below the upper limit value the buzzer stops sounding. Contact your Shimadzu representative if the message appears even after turning the heater ON again.
	Overheating and liquid leakage are detected at the same time.
The message "Ion gauge error" is displayed.	If the message appears even after turning the ion gauge ON again, it means that the filament of the ion gauge vacuum meter is broken. Contact your Shimadzu representative.
The message "Pirani gauge error" is displayed.	The filament of the Pirani gauge vacuum meter has broken. Contact your Shimadzu representative.

Problem	Cause / Corrective Action / See
The ionization unit cannot be closed.	The O-ring of the ionization unit is lifted. Correctly fit the O-ring into the groove.

6.1.2 Data Acquisition

Problem	Cause	Corrective Action / See
The ion intensity is unstable or low.	<i>ESI unit</i>	
	The capillary ASSY is blocked.	"7.2.1 Replacing the Tubing" P.126
	The tip of the capillary ASSY is projecting too far beyond the ESI probe, or is too recessed.	"7.2.1 Replacing the Tubing" P.126
	The ESI probe is substantially out of place.	"3.5.1 Mounting the ESI Unit" P.62
	The probe current (interface current) is too high. (It can become unstable as the result of discharge.)	Lower the interface voltage.
	The high voltage is not being supplied properly (broken wire).	Check the analysis method parameters and the tuning file. If there is no abnormality, contact your Shimadzu representative.
	<i>APCI unit</i>	
	The APCI pipe ASSY is blocked.	"7.3.1 Replacing the APCI Pipe" P.134
	The corona needle is substantially displaced from the center.	"3.6.1 Mounting the Needle Unit" P.69
	The corona needle is soiled.	"7.3.2 Cleaning and Replacement of the Corona Needle" P.140
	The probe current (interface current) is too high. (It can become unstable as the result of discharge.)	Lower the interface voltage.
	The probe has not been heated properly.	Check the analysis method parameters and the tuning file. Contact your Shimadzu representative if the situation does not improve.
	Broken wire in the high-voltage cable, heater cable or sensor.	Contact your Shimadzu representative.

Problem	Cause	Corrective Action / See
The ion intensity is unstable or low.	<i>DL</i>	
	The DL is blocked (the PG value is 50 Pa or lower).	"7.9 Replacing the DL" P.176
	The DL is soiled.	"7.9 Replacing the DL" P.176
	The probe has not been heated properly.	Check the analysis method parameters and the tuning file. If the situation does not improve, see "7.9 Replacing the DL" P.176.
	The wiring has not been done properly. (Parts are shorted.)	"7.9 Replacing the DL" P.176
	<i>Detector</i>	
	The detector voltage is too low.	"3.8.2 Starting Auto Tuning" P.84
	The detector has deteriorated.	"3.8.2 Starting Auto Tuning" P.84
	The attenuation is set low.	Adjust the attenuation. "6.1.3 Attenuation Settings" P.115
	<i>Heat block</i>	
	The heat block is soiled.	"7.8 Cleaning the Spray Unit" P.171
	<i>Lens system</i>	
	The skimmer is soiled.	"7.5 Maintenance of the Lens System" P.146
	The multipole is soiled.	"7.5 Maintenance of the Lens System" P.146
	The entrance lens of the multipole is soiled.	"7.5 Maintenance of the Lens System" P.146
	The skimmer or the entrance lens is blocked.	"7.5 Maintenance of the Lens System" P.146
	<i>Software</i>	
	The tuning file is not appropriate. An old tuning file is being used.	"3.8.2 Starting Auto Tuning" P.84
	The method file is not appropriate	Refer to the LabSolutions Getting Started Guide or Operators Guide.
	The batch file is not appropriate.	

Problem	Cause	Corrective Action / See
The base level (background level) is too high.	Soiling of the DL	"7.9 Replacing the DL" P.176
	Soiling of the heat block	"7.8 Cleaning the Spray Unit" P.171
	Soiling of the spray unit	"7.8 Cleaning the Spray Unit" P.171
	Soiling of LC (tubing and line filter) and column	Clean the flow line with cleaning fluid (see the LC pump instruction manual). Replace the column.
	Soiling of the ESI and/or APCI probe	Clean with the mobile phase (organic solvent). "7.8 Cleaning the Spray Unit" P.171
	Soiling due to the standard sample for auto tuning	"7.8 Cleaning the Spray Unit" P.171
	Soiling of the mobile phase	Replace the mobile phase and bottles.
	Influence of background noise originating from the mobile phase	-
	Soiling of the tubing	Clean the flow line, or replace the tubing.
The peaks are too wide.	There is dead volume in the tubing section that connects to the ionization probe.	Repair the connection.
	There is dead volume in the connecting section downstream of the injector.	Repair the connection.
	The tubing bore is too large (make the internal diameter downstream of the injector 0.13 mm).	Replace the tubing.
	The cut face of the tubing is inclined.	Replace the tubing.
	Soiling of the injector	Rinse the injector.
The baseline undulates.	Air is contained in the tubing.	Purge the LC pump.
	Air is contained in the mobile phase.	Degas the mobile phase.
	The temperature of the DL, heat block or interface heater is fluctuating.	Check if the DL, heater flange, and ionization unit are mounted properly. If the problem persists, contact your Shimadzu representative.

Problem	Cause	Corrective Action / See
The pump pressure is too high.	Blockage of the ESI capillary. Blockage of the APCI or SUS pipe.	"7.2.1 Replacing the Tubing" P.126 "7.3.1 Replacing the APCI Pipe" P.134
	Blockage of the tubing.	"7.2.1 Replacing the Tubing" P.126 "7.3.1 Replacing the APCI Pipe" P.134
	Blockage at the LC line or column.	Check the LC line or column and clear the blockage.
Auto tuning has failed.	The wrong standard sample was used.	"8.3.1 Method for Preparing the Standard Sample" P.233
	The standard sample is old (the spectrum has changed).	"8.3.1 Method for Preparing the Standard Sample" P.233
	There is a leak in the tubing of the standard sample introduction unit.	"8.1.5 Installing the Standard Sample" P.218 "7.6.2 Replacing the Resistance Tube" P.165
	The resistance tube is clogged.	"7.6.2 Replacing the Resistance Tube" P.165
	There is not a sufficient volume of standard sample in the standard sample bottle.	"7.6.1 Replacing the Standard Sample" P.162
	The ESI probe unit is out of position.	Adjust the ESI probe position to gain a stronger target m/z intensity. In particular, check that negative ions are m/z 1007 and that positive ions are m/z 1224.
	An interference peak exists around the target m/z.	After washing the ESI probe tubing with water or methanol, check that there is no interference peak around the target m/z in the manual tuning window. "7.8 Cleaning the Spray Unit" P.171 "8.2.1 Checking Ions in the [MS Tuning] Window" P.222
	The target m/z intensity decreases when using substances such as TFA.	"3.8.2 Starting Auto Tuning" P.84 "Interpreting tuning results" P.92
The peaks are split.	The ion intensity has exceeded 20 million. (The signal strength is too high, causing saturation.)	The sample concentration is too high. Dilute the sample before use.
	There is dead volume in the tubing.	Repair the tubing connection.
	There is a problem with the column.	Replace the column.

Problem	Cause	Corrective Action / See
The peak top is flat.	The ion intensity has exceeded 20 million. (The signal strength is too high, causing saturation.)	Adjust the attenuation. "6.1.3 Attenuation Settings" P.115
<i>Tubing</i>		
The pump pressure is too low.	There is a liquid leakage.	Identify and retighten any locations at which liquid is leaking.
The gas is not flowing according to the specified value.	There is a gas leak.	Check the gas tubing. "8.1.3 About the Gas Used" P.211
	The gas is not flowing.	Check that the ionization unit is mounted properly. "3.5.1 Mounting the ESI Unit" P.62 "3.6.2 Mounting the APCI Unit" P.71
The pumping is unstable. The pump pressure is unstable. The mobile phase is not flowing.	Insufficient purge. Blockage of the check valve.	Purge the LC pump and check the check valve (see the LC pump instruction manual).

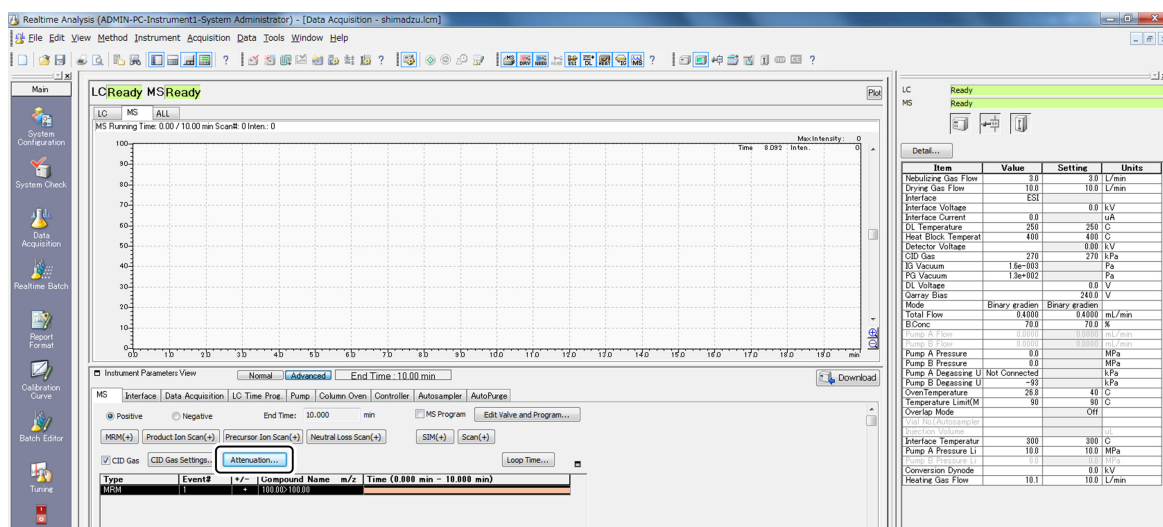
6.1.3 Attenuation Settings

If signal saturation occurs due to excessive ion intensity, attenuation adjustment may solve the problem. If the problem persists, dilute the sample.

1

Click **[Attenuation]**.

The **[Attenuation]** window is displayed.



2

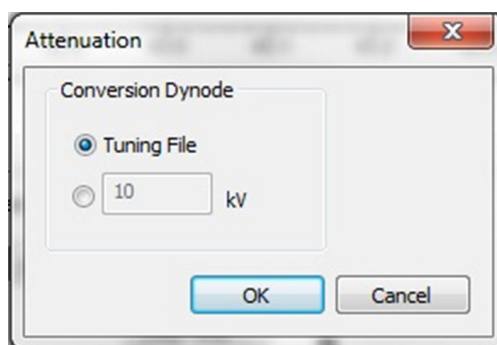
Adjust the conversion dynode voltage.

Set a voltage that will reduce the signal intensity to below 20 million. The default value is 10 kV.

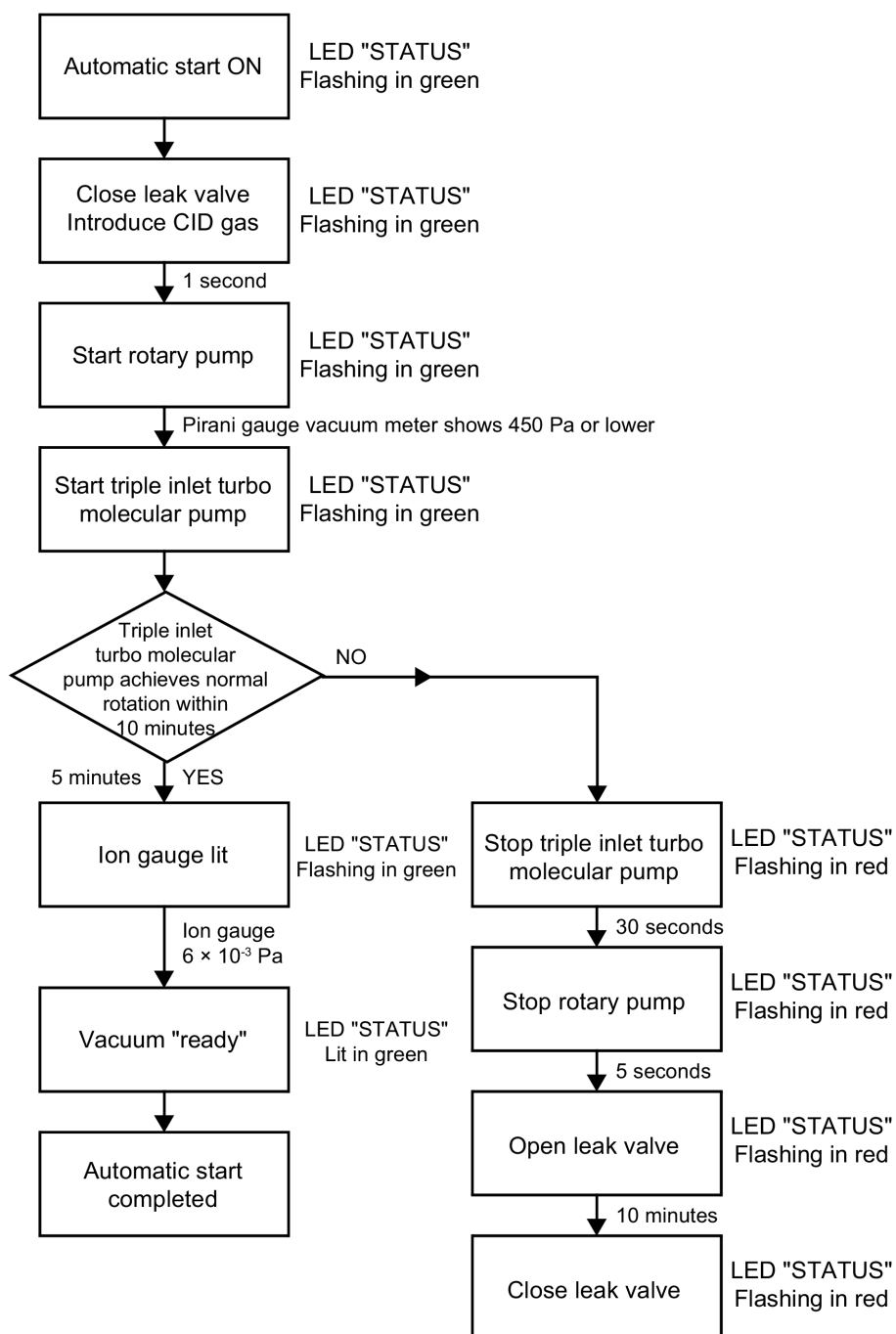


Hint

In the **[Attenuation]** window, **[Tuning File]** is selected as the default option. To change the conversion dynode voltage, select the other option (for manual setting) and enter the desired value in the box.

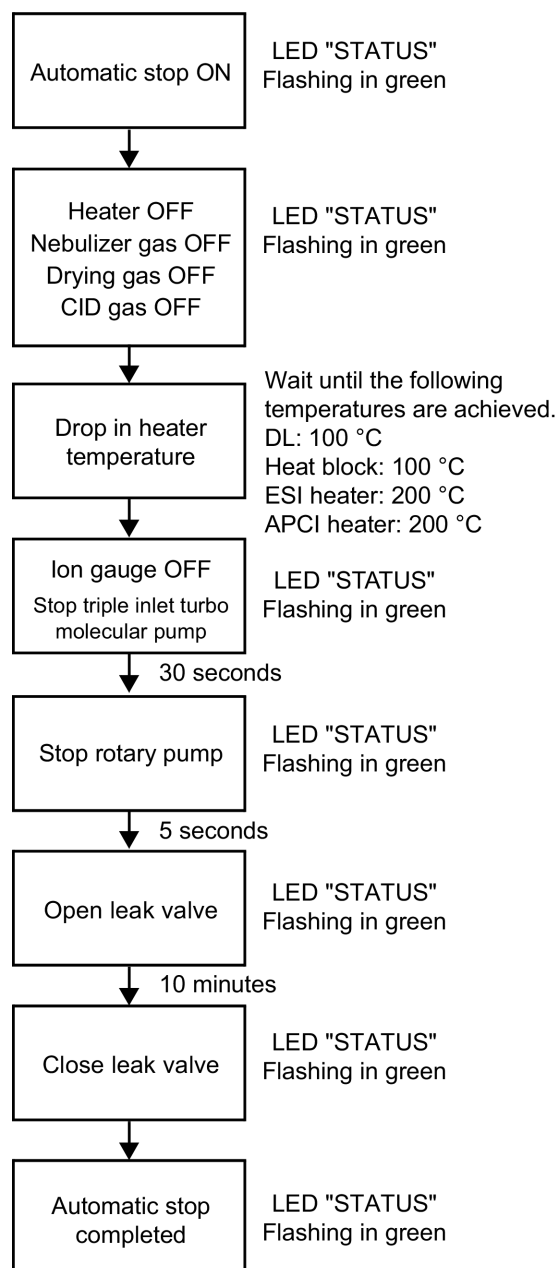


6.2 Operation Flow for Automatically Starting the Vacuum System



NOTE When the instrument has been stopped for a long time it takes some time to evacuate it and the "Ready" status may not be reached within the prescribed time. In this case the "STATUS" LED on the front of the instrument will continue to flash in green, but this does not indicate an abnormality. When the pressure has dropped the "Ready" status will be attained and the "STATUS" LED will light in green.

6.3 Operation Flow for Automatically Stopping the Vacuum System

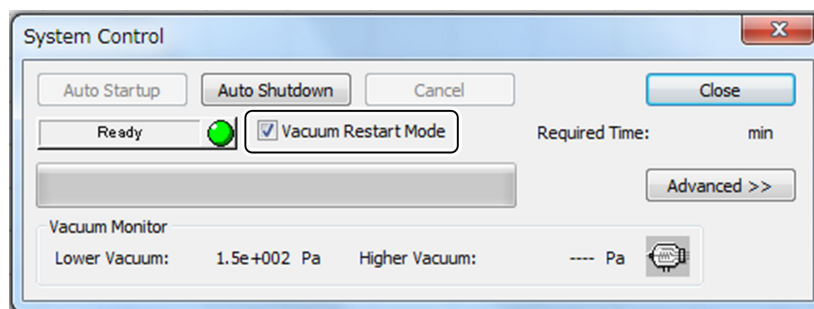


NOTE To turn the vacuum system off manually, turn each of the heaters OFF and, when the temperature has fallen to 100 °C or lower, stop the vacuum pump.

6.4 Power Outages

If the 230 V AC power supply to the LCMS-8050 has been cut off and LabSolutions is set to the automatic restart mode, the vacuum system will automatically start when the power is restored.

NOTE To set the automatic recovery mode, select [System Control] from the assistant bar in the LabSolutions analysis window and check the [Vacuum Restart Mode] box in the [System Control] window.
If automatic restart is not set, start the instrument by referring to ["3.1 Starting the Instrument" P.44](#).



7.1 Periodic Inspections and Servicing

In order to use this product safely, carry out periodic inspections.
Conduct everyday maintenance and management of performance as appropriate.
For details on maintenance inspection contracts, consult your Shimadzu representative.

WARNING



Instruction

Before starting maintenance or servicing work, turn the power to the product OFF.

Otherwise there will be a risk of fire, electric shock and instrument failure.



Prohibition

Never remove the main body cover.

This may cause injury or damage the instrument.

If repair work that necessitates removal of the main body cover is required, consult your Shimadzu representative.

CAUTION



Instruction

When replacing parts, use the parts specified by Shimadzu.

Using parts other than those specified could lead to breakage of parts, injuries or instrument failure.



Instruction

When carrying out periodic inspections, observe the cautions on each operation.



Instruction

Wear clean gloves when carrying out maintenance work on the ion source unit, the lens system or the interface.



Instruction

Be sure to wipe off any soiling on the tools used for maintenance work on the ion source unit, lens system or interface using gauze impregnated with acetone.

Using soiled tools or gloves will cause background noise.



Instruction

Place removed parts on clean fabric such as gauze.

If you place parts on soiled fabric they will become soiled.

7.1.1 List of Periodic Inspections and Servicing

! CAUTION

Instruction

The replacement and inspection frequencies indicated in this list are merely for guidance.

They are not guaranteed intervals. There is some latitude in the appropriate frequency depending on the conditions of use.

**NOTE**

The asterisks in the "Replacement/Inspection Frequency" column indicate that the replacement parts are included in the PM 3-year maintenance part kit (P/N S225-15869-42). Work indicated with ** must be performed by service personnel. Biological contamination may make it impossible for service personnel to work.

■ Replacement

Inspection/Service Operation or Part	Part No.	Replacement/Inspection Frequency				Remarks
		Every 6 Months	Every Year	Every 2 Years	Every 3 Years	
ESI unit						▶▶ Reference P.125
Capillary ASSY	S225-14948-91	✓				
PEEK tube	S228-32999-01		✓			
Heater ASSY	S225-19560-41				✓**	
O-ring, 4D-S8	S036-19004-05				✓*	Capillary holder
APCI unit						▶▶ Reference P.133
Heater unit ASSY	S225-15619-41	✓				
Corona needle (for both APCI and DUIS)	S225-15877-92				✓	
APCI pipe ASSY	S225-15845-91	✓				
DUIS						▶▶ Reference P.143
Corona needle (for both APCI and DUIS)	S225-15877-92				✓	
Interface						▶▶ Reference P.170, P.176, P.182
DL ASSY2	S225-15718-42	✓				
Orifice	S225-15479				✓*	
Sampling cone	S225-15487				✓*	
M6PEEK washer for heater flange	S023-65106-01			✓		
O-ring, 4D-P95	S036-11267				✓*	

Inspection/Service Operation or Part	Part No.	Replacement/Inspection Frequency				Remarks
		Every 6 Months	Every Year	Every 2 Years	Every 3 Years	
Lens system						▶▶ Reference P.194
Multipole 1	-					
Multipole 2	-					
O-ring, AS568A-253	S036-15552-53				✓*	Door unit
Vacuum system						▶▶ Reference P.263, P.264
IG GAUGE	S225-09490-01				✓*,**	
Gasket 14	S261-00207-02				✓*,**	IG unit
Pirani gauge filament	S225-20310-91				✓*,**	
RP oil #46 (4L)	S017-30163-02		✓			Changed 3 times per year 1.5 L used in each oil change
SI unit ASSY						▶▶ Reference P.162
PEEK frit	S228-48607-91				✓*	
Resistance tube, alone	S225-15873-91			✓		
Spacer, FKM	S225-15697-01		✓			
Detector						▶▶ Reference P.34
EM, MS644	S225-14168-01			✓**		
N2 gas related						▶▶ Reference P.171 , P.176 , P.182
FEP tube for nebulizer gas, 1/16	S225-14255-41			✓**		Cut off 1 cm from the end of the tube once every 2 years.
Sample						▶▶ Reference P.233
Sample for auto tuning (200 mL)	S225-14122-01		✓			
Waste liquid related						▶▶ Reference P.195
Waste tube (Spray unit)	S016-31414				✓	Changed once every 3 years
Waste tube (Leak tray)	S016-31350-19				✓	

■ Overhaul

! CAUTION

Instruction

Perform overhauls.

If a rotary pump is not overhauled, it may cause an accident or performance may decrease, resulting in damage to the instrument.

Overhauls must be performed by service personnel.

**NOTE**

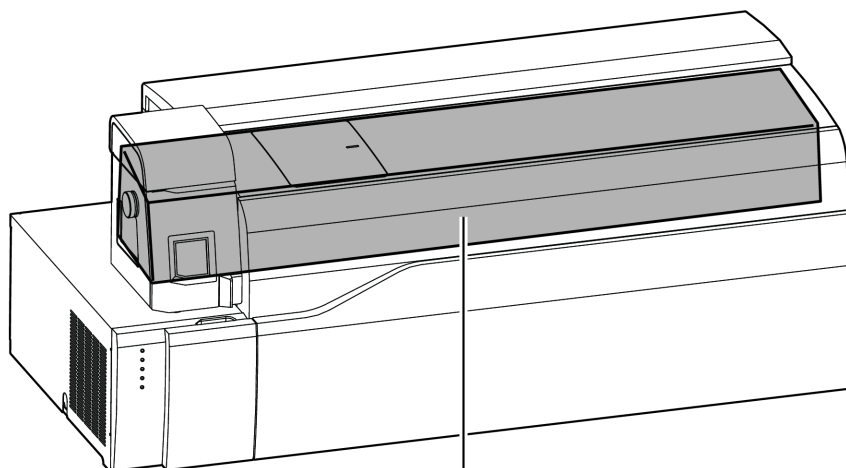
Biological contamination may make overhaul/repair of the pump impossible, requiring you to purchase a new one.

Inspection/Service Operation or Part	Part No.	Replacement/Inspection Frequency				Remarks
		Every 6 Months	Every Year	Every 2 Years	Every 3 Years	
Vacuum system						▶▶ Reference P.262
RP E2M28 230V	-			✓		
Triple inlet turbo molecular pump body and SplitFlow™ 310 set	-				✓	

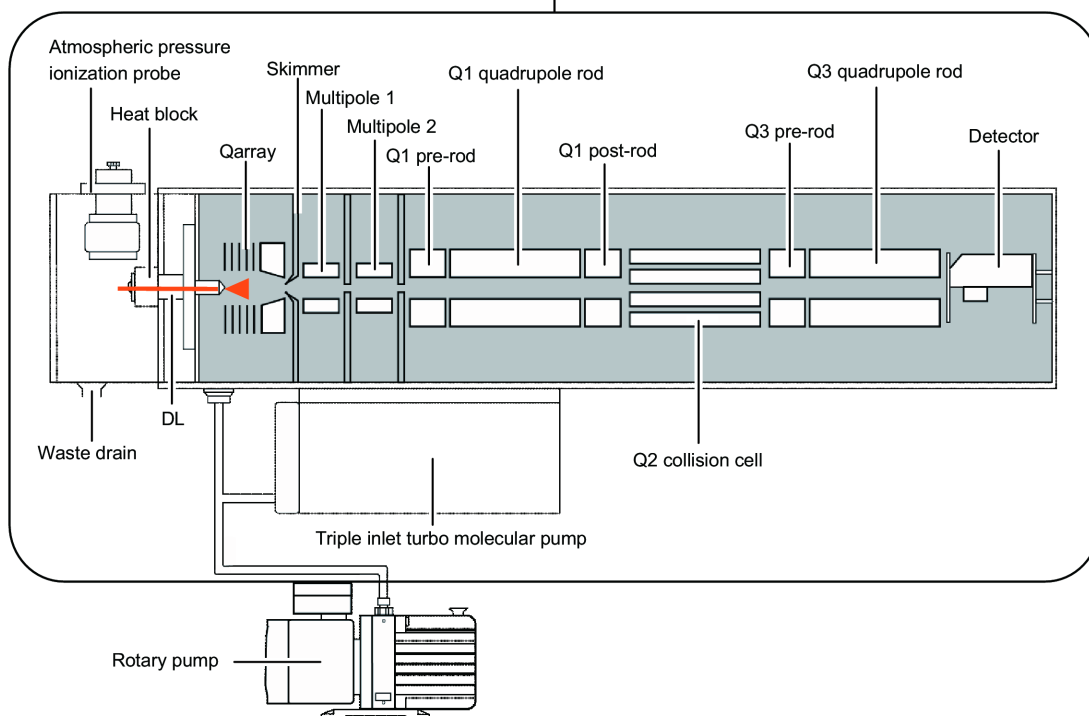
■ Cleaning

Inspection/Service Operation or Part	Part No.	Replacement/Inspection Frequency				Remarks
		Every 6 Months	Every Year	Every 2 Years	Every 3 Years	
APCI unit ▶▶ Reference P.140						
Corona needle (for both APCI and DUIS)	-	✓				
Interface ▶▶ Reference P.171, P.182						
Spray unit	-	✓				
Sampling cone	-	✓				Cleaning
Orifice	-			✓		Cleaning
Lens system ▶▶ Reference P.146						
Qarray	-	✓				Cleaning
Skimmer	-	✓				Cleaning
Multipole 1	-	✓				Cleaning
Multipole 2	-	✓				Cleaning
Collision cell ▶▶ Reference P.31						
CID cell ASSY	-		✓**			Cleaning

- ▼ **NOTE**
- Work indicated with ** must be performed by service personnel.
 - Biological contamination may make it impossible for service personnel to work.
 - The cleaning frequency of the interface, lens system, or collision cell may differ depending on the operating conditions at your site.



Inside the LCMS-8050



7.2 Maintenance of the ESI Unit

WARNING



Instruction

Before starting maintenance work, turn the high-voltage OFF in the LabSolutions program.

If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference "4.3 Turning the High Voltage ON/OFF" P.100

CAUTION



Instruction

When performing ESI analysis in which a halogenated mobile phase additive is used, note the following:

In the ESI method, the analyte is heated to high temperatures. If the mobile phase contains a halogenated compound such as chloroform, a corrosive gas will be produced. Even a small percentage concentration of halogens in the mobile phase can cause corrosion.

Use SUS tubes to connect the high performance liquid chromatograph to the instrument. PEEK resin tubes do not have sufficient strength and should they rupture, solvent may blow out.

Black particles may build up inside the ESI unit, and around the DL and the heat block.

Because of exposure to corrosive gases, you may need to replace the following parts at a shorter interval than specified.

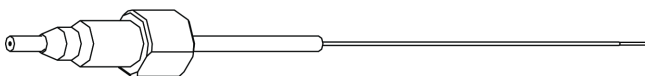
Part Name	Part No.
Capillary ASSY	S225-14948-91
Heater ASSY	S225-19560-41
Heater flange	S225-19463-41
DL ASSY2	S225-15718-42

7.2.1 Replacing the Tubing

A high voltage (up to 5 kV) is applied to the sample solution sprayed from the tip of the capillary ASSY in order to ionize the sample. Since a very fine-gauge tubing is used in the capillary ASSY, if any very small pieces of dirt get into the mobile phase or the sample, they can cause a blockage which will lead to a rise in the pump pressure.

If this happens, replace the tubing of the capillary ASSY.

Parts used

Part Name	Part No.
Capillary ASSY	S225-14948-91
	
O-ring	S036-19004-05

1

Turn the LC pump OFF and disconnect the tubing from the LC.

2

Remove the ESI unit from the instrument.

▶▶ Reference "3.5.2 Removing the ESI Unit" P.66

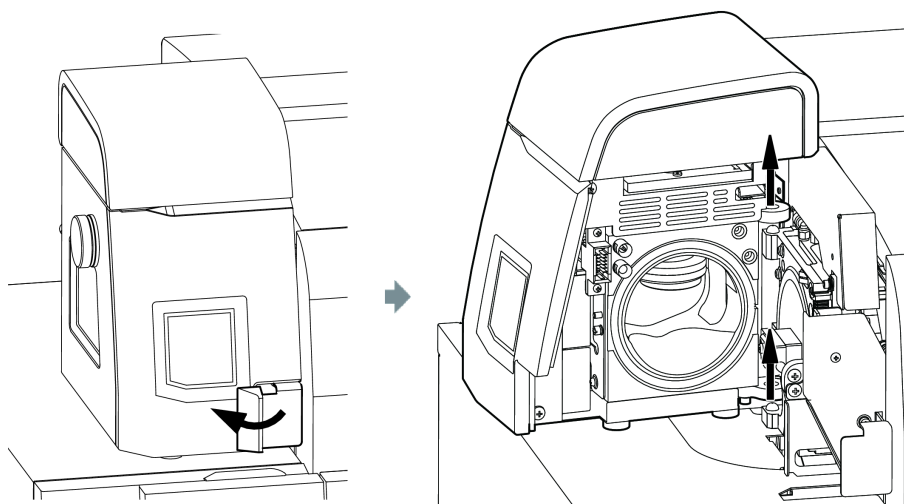
WARNING



Instruction

The inside of the ESI unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

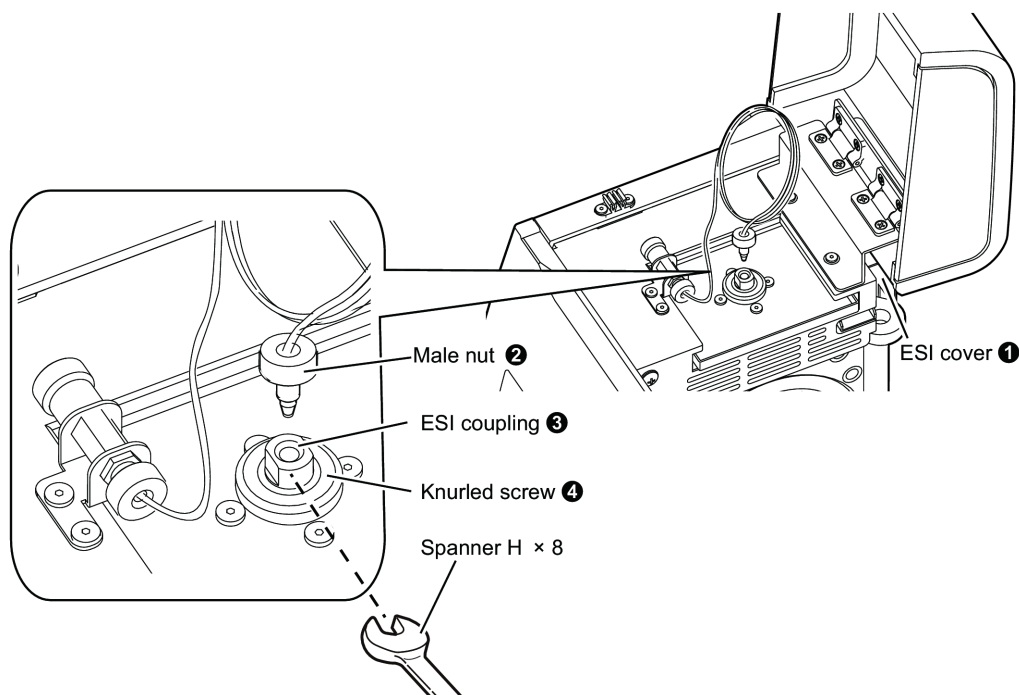
The inside of the ESI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.



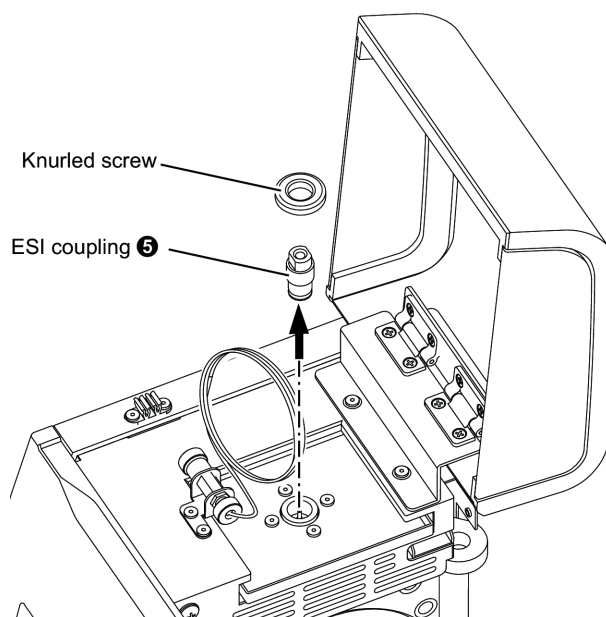
3

Remove the ESI coupling.

- 1 Open the ESI cover ❶.
- 2 Loosen the male nut ❷ by hand and remove it.
- 3 Loosen the ESI coupling ❸ with the spanner.
- 4 Remove the knurled screw ❹.



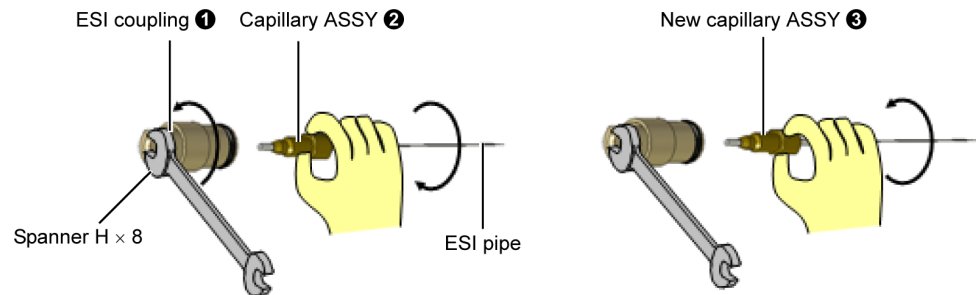
- 5 Loosen the ESI coupling ❺ completely, and remove it in the direction indicated by the arrow.



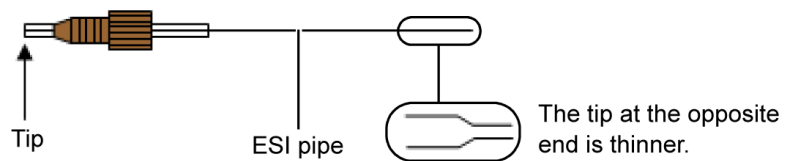
4

Replace the capillary ASSY.

- 1 Remove the capillary ASSY ② from the ESI coupling ①.
- 2 Mount the new capillary ASSY ③ on the ESI coupling ①.
Tighten it firmly by hand.



NOTE Make sure that the tip of the ESI pipe is not either projecting too far or too recessed.



5

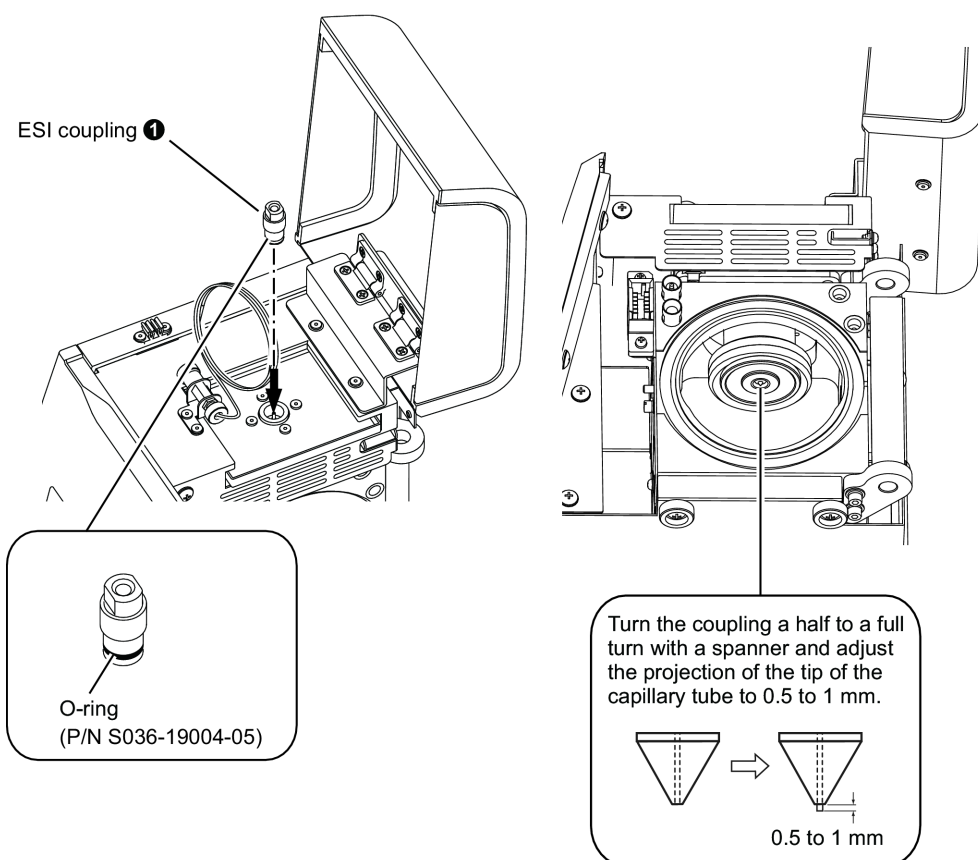
Mount the ESI coupling in the ESI probe unit.

- 1 Insert the ESI coupling ❶ into the ESI probe unit.

 **Hint** If the O-ring of the ESI coupling is damaged, replace it.

► Reference "10.3.1 ESI Unit: S225-19550-41" P.252

- 2 Tighten the ESI coupling ❶ by hand and then turn it with a spanner, and adjust the projection of the tip.
Adjust so that the tip of the capillary ASSY projects about 0.5 to 1 mm.



6

Secure the ESI coupling in place.

- 1 Turn the knurled screw ❶ by hand and fix the position of the ESI coupling.
- 2 Turn the male nut ❷ by hand to secure the PEEK tube.
When securing the male nut ❷, press against the PEEK tube ❸ while tightening it.

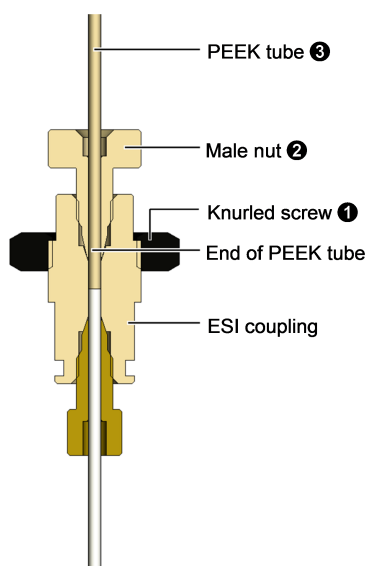
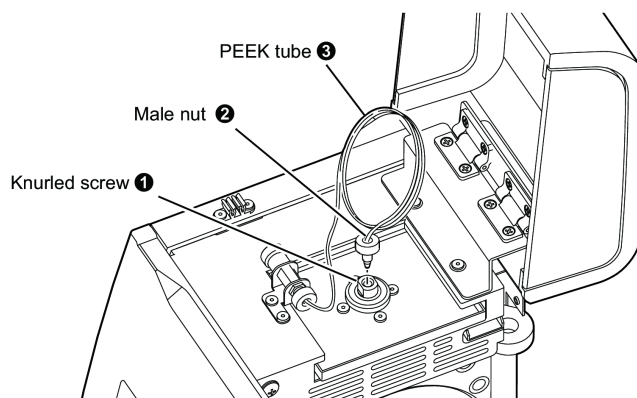
! WARNING

Instruction

In case of liquid leak, turn the high-voltage OFF in the LabSolutions program before wiping up the liquid.

If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference ["4.3 Turning the High Voltage ON/OFF" P.100](#)



7.2.2 Replacing the PEEK Tube

As a result of contamination in the mobile phase or sample, the tube may become blocked, causing the pump pressure to rise.
In addition, the sensitivity may decrease due to the contamination or clogging in the tube.

Parts used

Part Name	Part No.
PEEK tube, $\Phi 1.6 \times \Phi 0.13$, red, 1 m	S228-32999-01

1

Turn the LC pump OFF and disconnect the tubing from the LC.

2

Replace the PEEK tube.

- 1 Remove the male nuts ❶ at both ends and remove the PEEK tube ❷.
- 2 Replace the PEEK tube with the new one.
The standard tube length is 420 mm.

- 3 Attach the tube to the ESI probe unit and tighten the male nut at each end by hand.

! WARNING

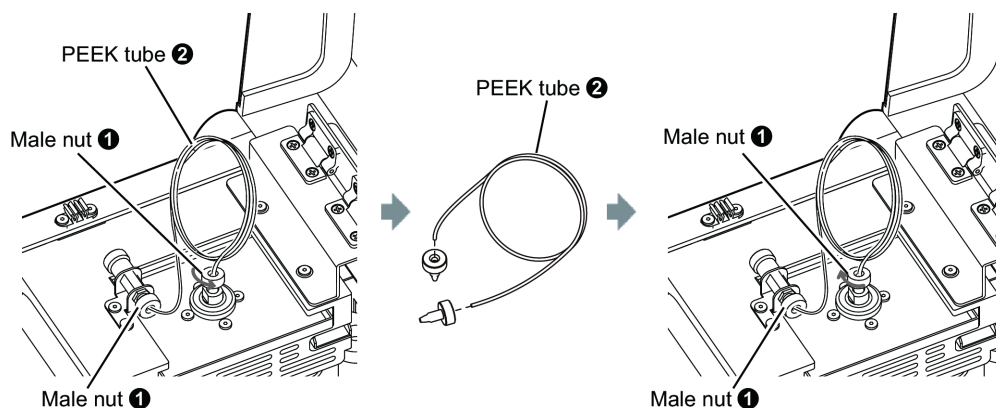


Instruction

In case of liquid leak, turn the high-voltage OFF in the LabSolutions program before wiping up the liquid.

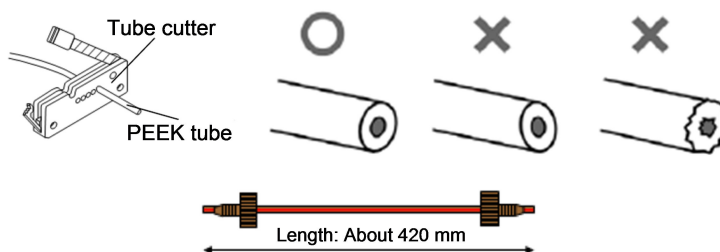
If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference "4.3 Turning the High Voltage ON/OFF" P.100



- ▼ **NOTE**
- If you are going to cut the PEEK tube before using it, use a tube cutter.
 - When securing the male nuts, press against the PEEK tube while tightening them.

- 💡 **Hint**
- The tube cutter (S228-32930-01) is not provided as an accessory. It is an option.
 - Make sure that the cut face of the PEEK tube is always square. Cutting the tube on an incline will create dead volume which will lead to broadening of peaks.



7.3 Maintenance of the APCI Unit

WARNING



Instruction

Before starting maintenance work, turn the high-voltage OFF in the LabSolutions program.

If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference "4.3 Turning the High Voltage ON/OFF" P.100

CAUTION



Instruction

When performing APCI analysis in which a halogenated mobile phase additive is used, note the following:

In the APCI method, the analyte is heated to high temperatures. If the mobile phase contains a halogenated compound such as chloroform, a corrosive gas will be produced. Even a small percentage concentration of halogens in the mobile phase can cause corrosion.

Use SUS tubes to connect the high performance liquid chromatograph to the instrument. PEEK resin tubes do not have sufficient strength and should they rupture, solvent may blow out.

Black particles may build up inside the APCI unit, and around the DL and the heat block.

Because of exposure to corrosive gases, you may need to replace the following parts at a shorter interval than specified.

Part Name	Part No.
APCI pipe ASSY	S225-15845-91
Nebulizer joint ASSY	S225-15788-91
Heater unit ASSY	S225-15619-41
Adapter	S225-04993
Ferrule	S225-03748-03
Nut	S225-15739
Heater flange	S225-19463-41
Needle unit	S225-14290-41
DL ASSY2	S225-15718-42

7.3.1 Replacing the APCI Pipe

Parts used

Part Name	Part No.
APCI pipe ASSY	S225-15845-91



■ Removing the APCI pipe

1

Remove the APCI unit from the instrument.

▶▶ Reference ["3.6.3 Removing the APCI Unit" P.73](#)

! WARNING



Instruction

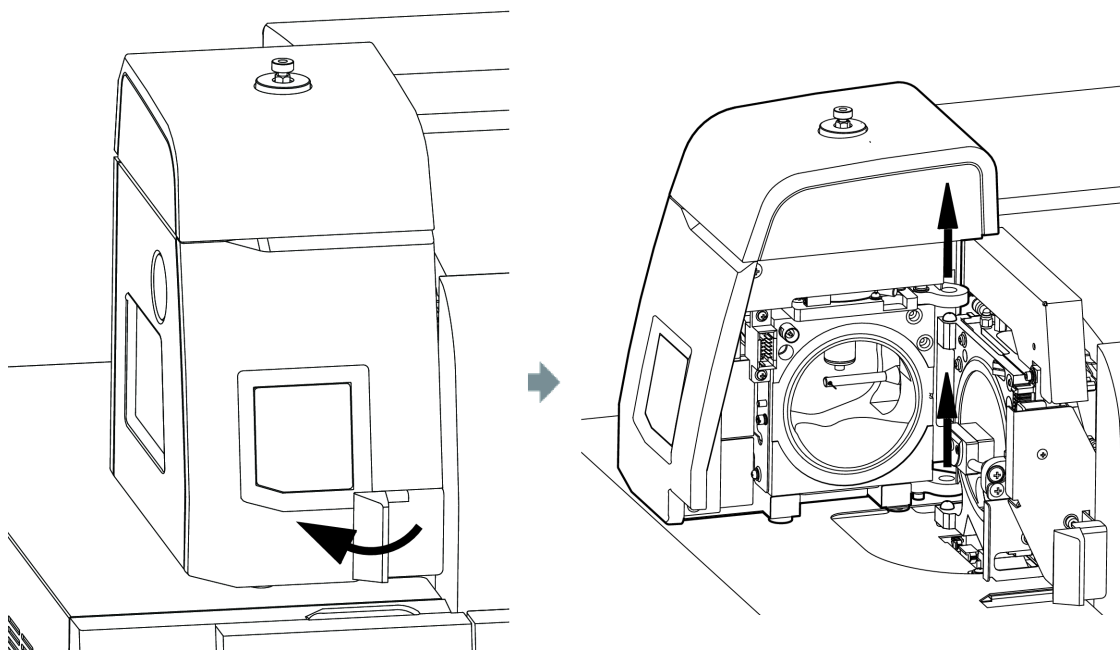
Take care because the tip of the corona needle is sharp.



Instruction

The inside of the APCI unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

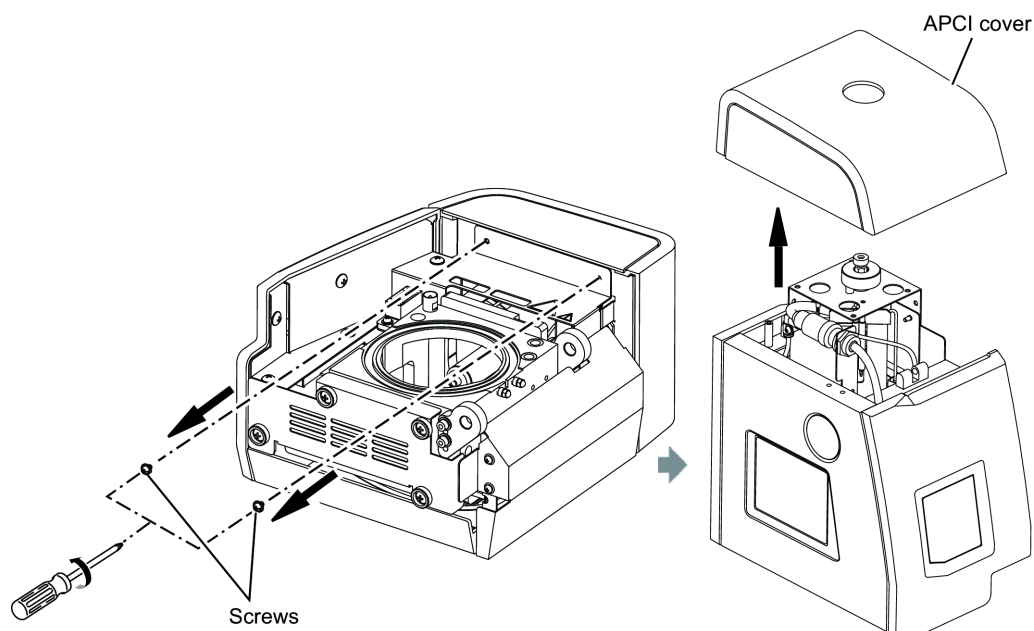
The inside of the APCI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.



2

Remove the APCI cover.

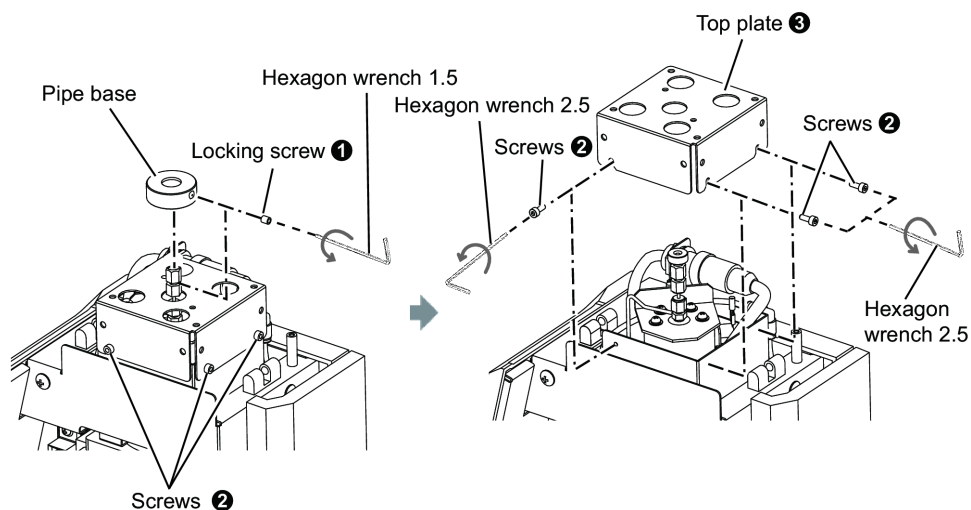
- 1 Remove the two screws which secure the APCI cover.
Use a Phillips screwdriver.
- 2 Remove the APCI cover.



3

Remove the top plate.

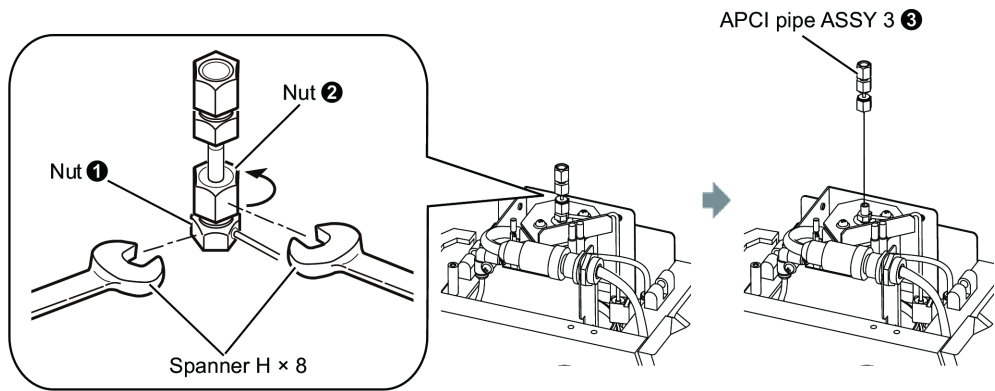
- 1 Remove the locking screw ❶ to remove the pipe base.
Use a hexagon wrench 1.5.
- 2 Loosen the screws ❷ at three locations.
Use a hexagon wrench 2.5.
- 3 Remove the top plate ❸.



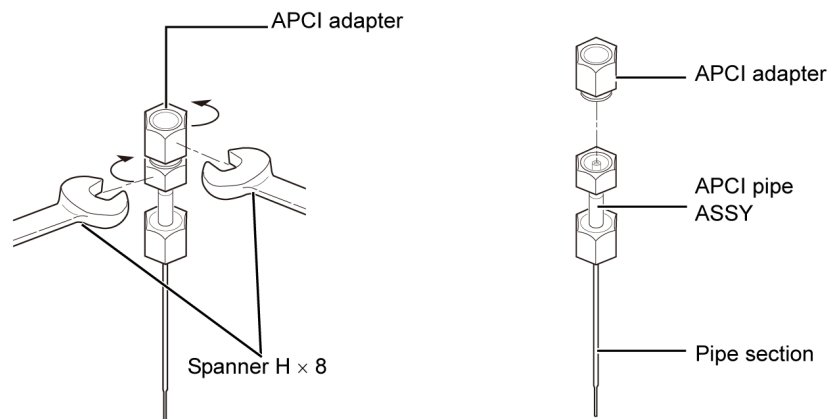
4

Remove the APCI pipe ASSY.

- 1 Hold the nut ❶ at the heater side steady and turn the APCI adapter nut ❷.
- 2 Remove the APCI pipe ASSY ❸.



5

Remove the APCI adapter from the APCI pipe ASSY.

NOTE Handle the pipe section of the APCI pipe ASSY with care since it is easily bent.

■ Mounting the APCI pipe

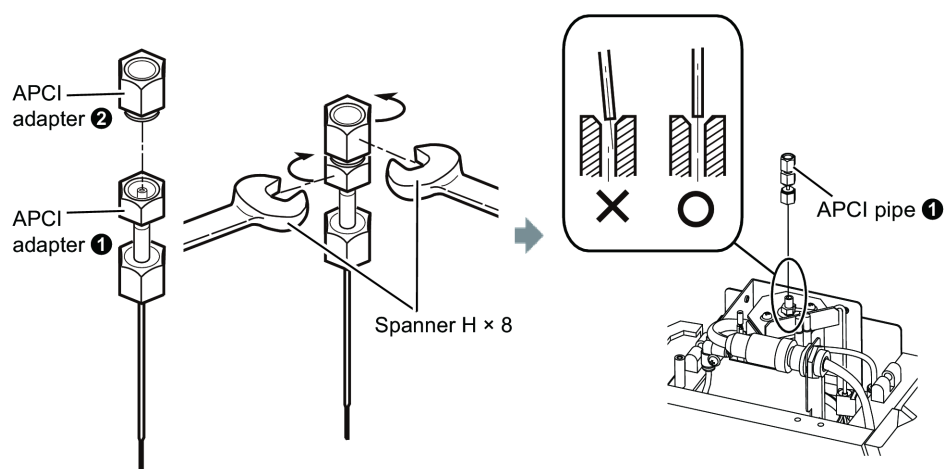
1

Mount the APCI pipe.

- 1 Mount the APCI adapter ② on the new APCI pipe ①.

▼ **NOTE** Finger-tighten the APCI adapter and then turn it another quarter of a turn with the spanner.

- 2 Insert the APCI pipe into the APCI probe and fix the pipe firmly with the spanner. Insert the tip of the APCI pipe while keeping the pipe vertical.

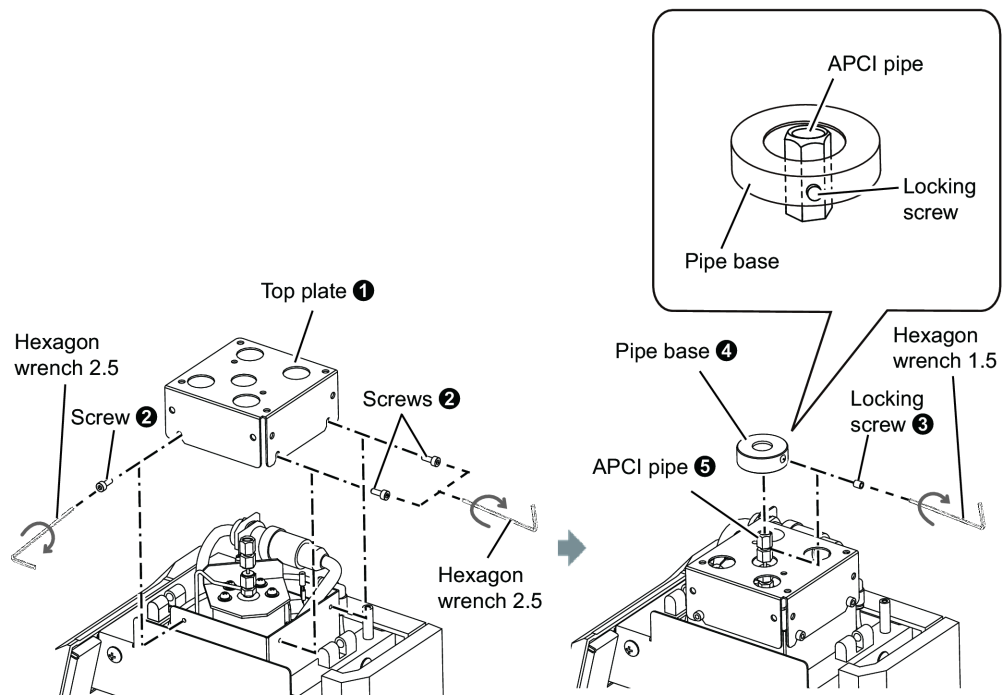


2

Mount the top plate.

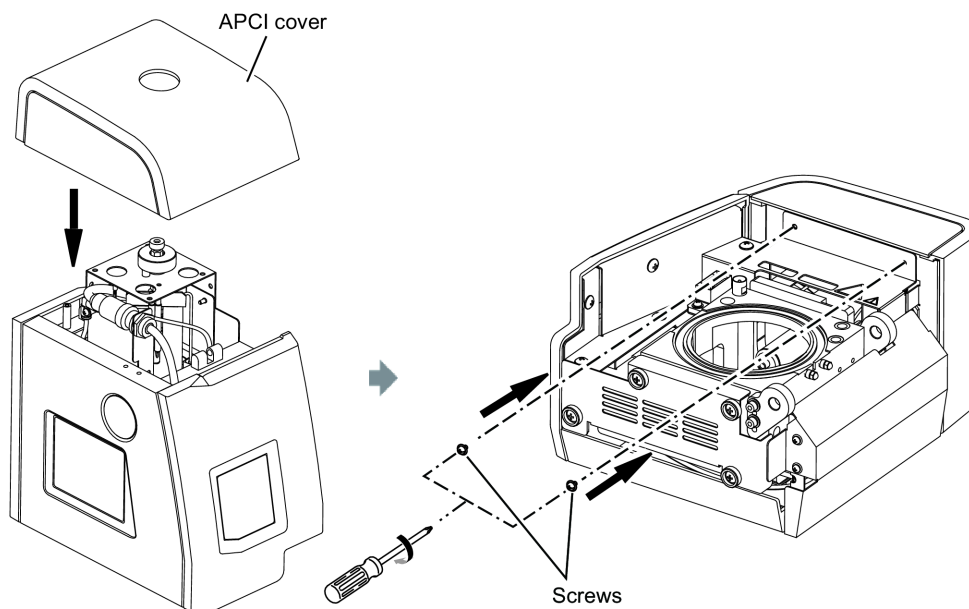
- 1 Mount the top plate ❶ for the APCI pipe.
- 2 Secure the top plate with the screws ❷ at three locations.
- 3 Secure the pipe base ❹ to the APCI pipe ❺ with the locking screws ❸.

NOTE Make sure that the locking screw is secured to one of the flat edges of the nut.



3**Mount the APCI cover.**

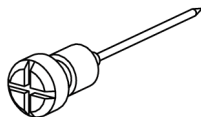
- 1 Mount the APCI cover.
- 2 Secure the APCI cover with screws at two locations.
Use a Phillips screwdriver.



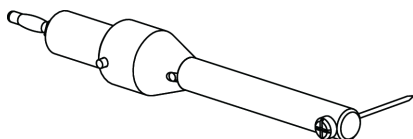
7.3.2 Cleaning and Replacement of the Corona Needle

Parts used

Part Name	Part No.
Corona needle	S225-15877-92



Needle unit	S225-14290-41
-------------	---------------

**1**

Remove the needle unit from the instrument.

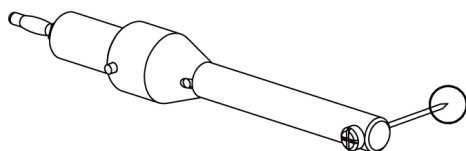
▶▶ Reference ["3.6.4 Removing the Needle Unit" P.75](#)

WARNING



Instruction

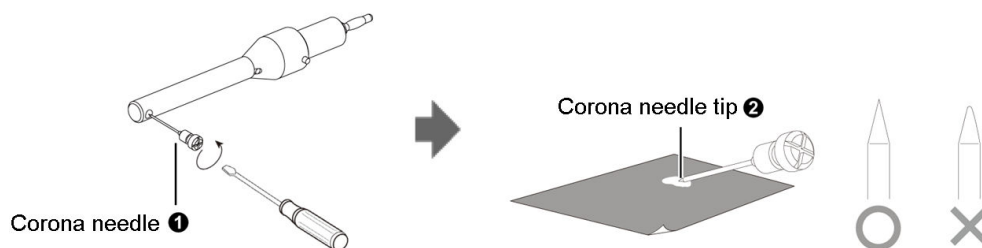
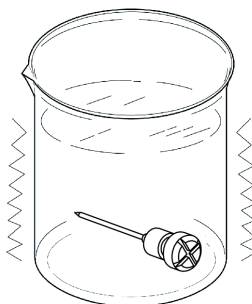
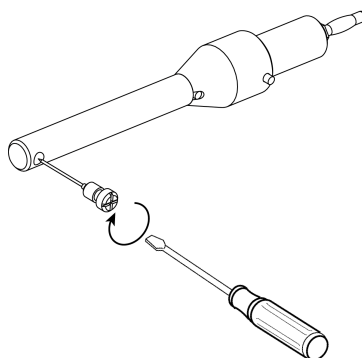
Take care because the tip of the corona needle is sharp.



If the tip of the needle is blackened or there is a foreign body present, clean the needle.

2**Polish the corona needle.**

- 1 Remove the corona needle with a screwdriver.
- 2 Polish the corona needle ②.
Polish the tip of the needle using about 4-micron lapping film. When polishing, take care not to curve the tip.

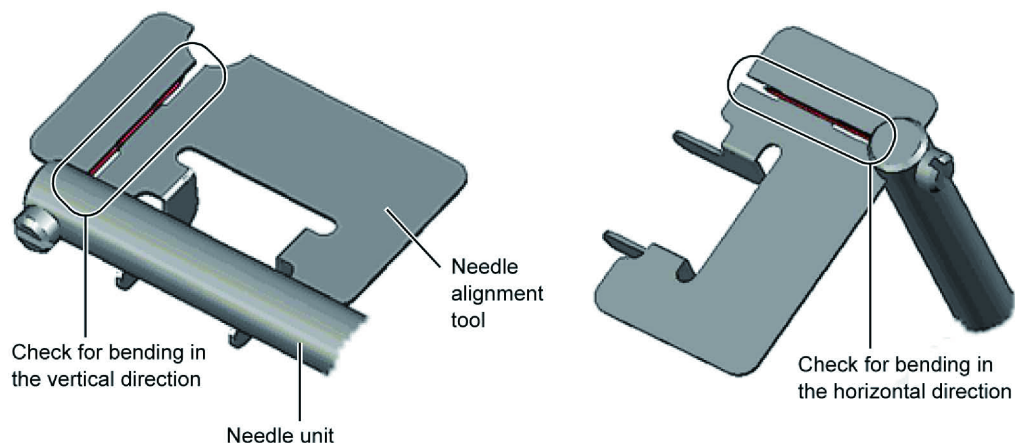
**3****Immerse the corona needle in methanol and clean it by ultrasonic cleaning.****4****Mount the corona needle on the support arm.****7**

5

Mount the needle unit on the instrument.

▶▶ Reference ["3.6.1 Mounting the Needle Unit" P.69](#)

NOTE Before mounting the needle unit, check that the tip of the corona needle is not bent by using the needle alignment tool. Check that the needle is contained within the range of the slit and repair the needle if it is bent.



7.4 Maintenance of DUIS

For maintenance procedures relating to the ESI unit, see "7.2 Maintenance of the ESI Unit" P.125.

WARNING



Instruction

Before starting maintenance work, turn the high-voltage OFF in the LabSolutions program.

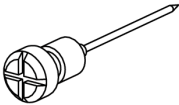
If you do not turn the high-voltage OFF, there will be a danger of electric shock.

▶▶ Reference "4.3 Turning the High Voltage ON/OFF" P.100

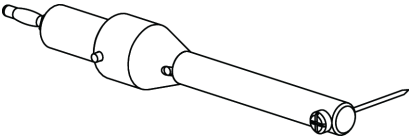
7.4.1 Cleaning or Replacing the Corona Needle

Parts used

Part Name	Part No.
Corona needle	S225-15877-92



Needle unit	S225-14290-41
-------------	---------------



1

Remove the needle unit from the instrument.

►► Reference "3.7.2 Removing the Needle Unit" P.80

! WARNING

Instruction

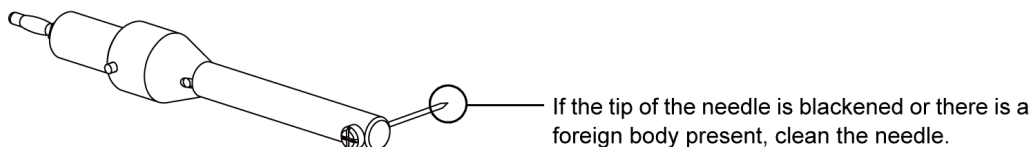
Take care because the tip of the corona needle is sharp.



Instruction

The inside of the ESI unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

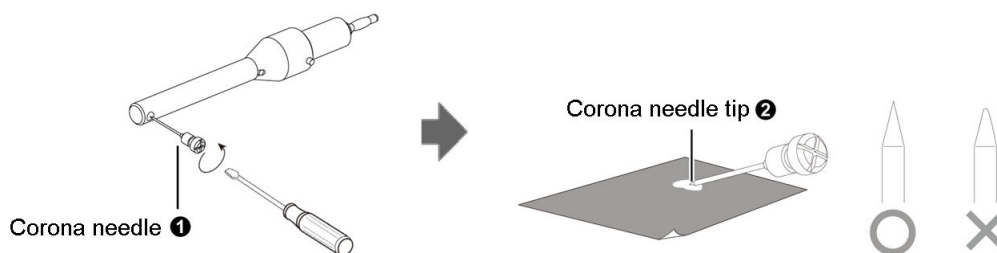
The inside of the ESI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.



2

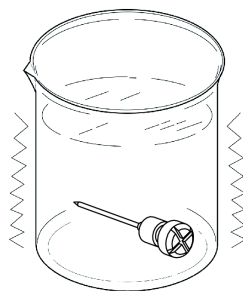
Polish the corona needle.

- 1 Loosen the corona needle ❶ with a screwdriver and remove it.
- 2 Polish the tip ❷ of the corona needle.
Polish the tip of the corona needle using about 4-micron lapping film. When polishing, take care not to curve the tip.

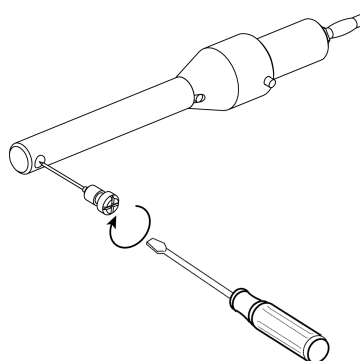


3

Immerse the corona needle in methanol and clean it by ultrasonic cleaning.

**4**

Mount the corona needle on the support arm.



NOTE Check the mounting angle of the corona needle with the tool and, if the angle is incorrect, correct it.

▶▶ Reference "7.3.2 Cleaning and Replacement of the Corona Needle" P.140

5

Mount the needle unit to the instrument.

▶▶ Reference "3.7.1 Mounting the Needle Unit" P.76

7.5 Maintenance of the Lens System

WARNING



Instruction

Stop the vacuum system and turn the instrument power switch OFF before starting maintenance work.

If you do not turn the power switch OFF there will be a danger of electric shock.

CAUTION



Instruction

Wear clean gloves when carrying out maintenance work on the lens system.

Since the lens system focuses the ions generated by the ionization unit, it becomes soiled over long periods of use and the detection sensitivity diminishes. For this reason you must clean the following lens system components: Qarray, skimmer, and multipoles. Also, clean the lens system components when a considerable decrease in sensitivity is observed.

7.5.1 Removing the Multipoles

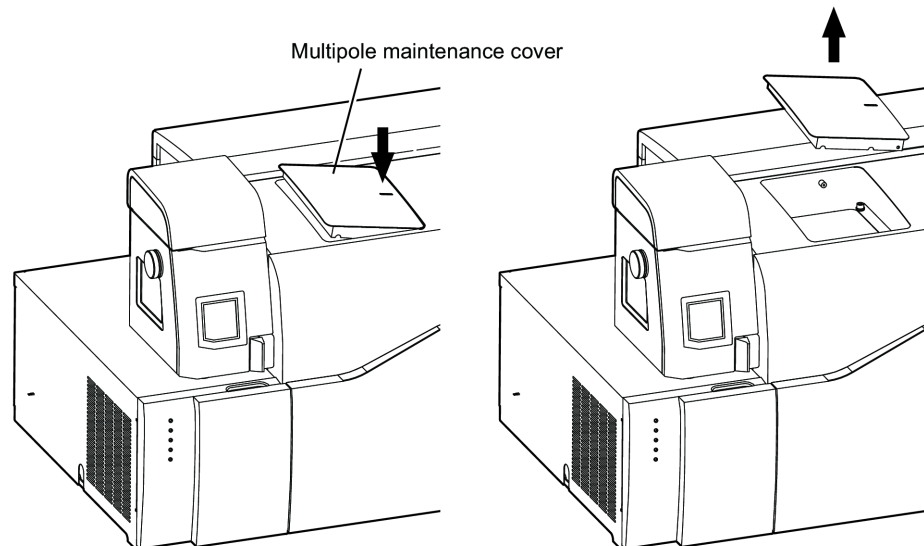
1

Stop evacuation and turn the power switch OFF.

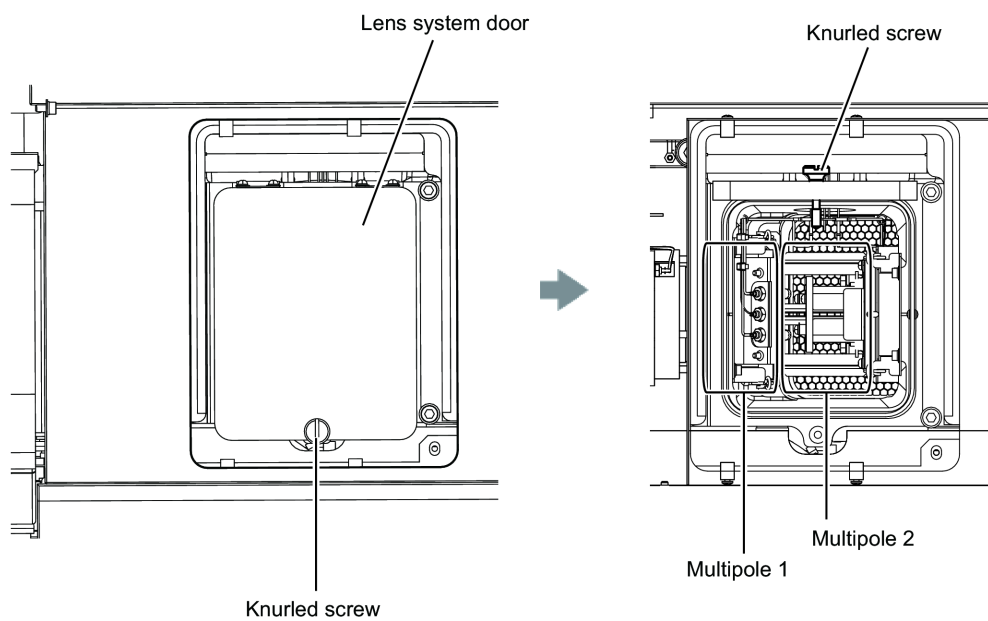
▶▶ Reference ["3.2 Stopping the Instrument" P.53](#)

2**Open the multipole maintenance cover.**

- 1 Press the indentation with your finger.
- 2 Lift the entire cover upward to remove it.

**3****Open the lens system door.**

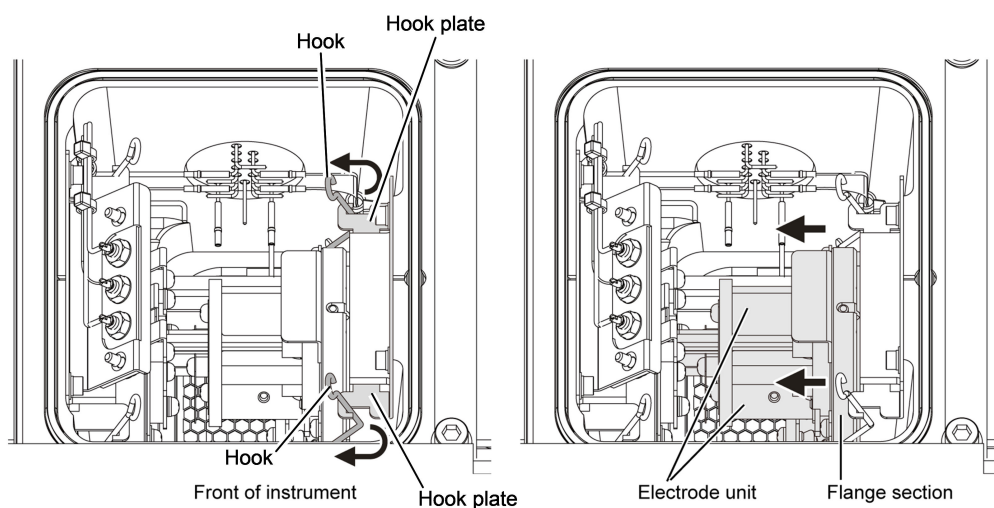
Loosen the knurled screw to open the door. The vacuum housing must be opened to atmosphere before opening the door.

**7**

4

Remove multipole 2.

- 1 Remove the hooks at two locations from the hook plate.
- 2 Holding the flange section, slide the multipole 2 in the direction indicated by the arrow, and lift it upward.



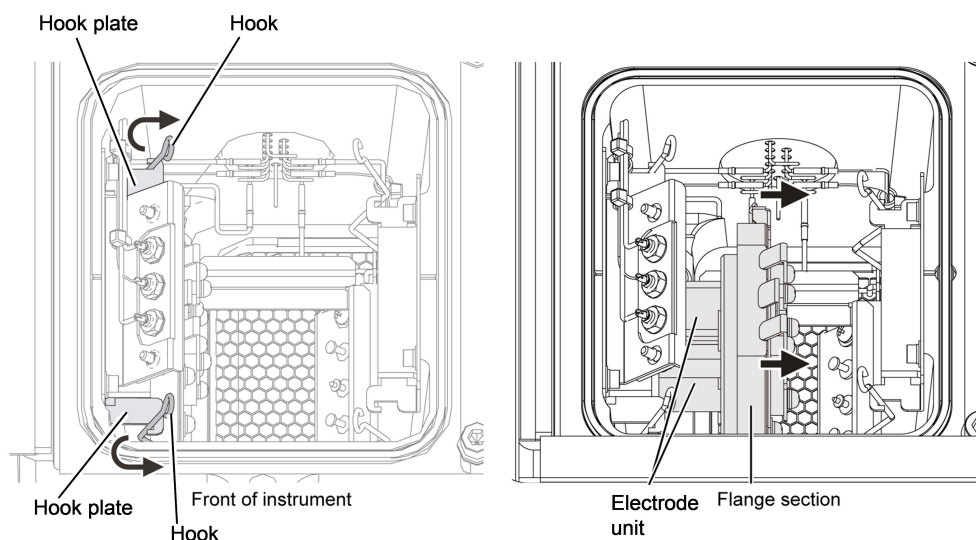
 **Hint** Once you have removed the flange section, lift the multipole upward while keeping it horizontal.

-  **NOTE**
- Hold the flange section during removal so that you do not touch the electrode unit.
 - Do not place any parts on top of the instrument.

5

Remove multipole 1.

- 1 Remove the hooks at two locations from the hook plate.
- 2 Holding the flange section, slide the entire multipole 1 in the direction indicated by the arrow, and lift it upward.



7.5.2 Cleaning the Multipoles

! CAUTION

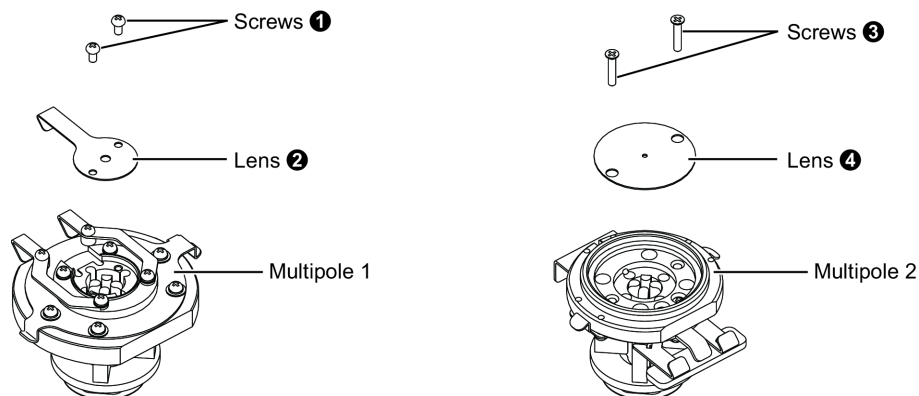
Prohibition

Do NOT disassemble either multipole body.
Disassembling them could cause injuries and instrument failure.

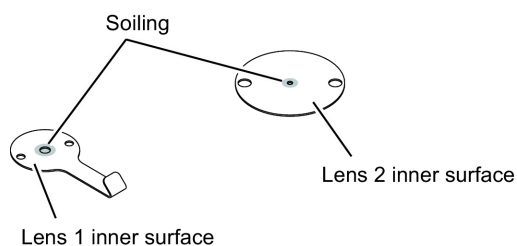
1

Clean the multipoles.

- 1 Remove the two screws **1** and **3** and then remove lenses **2** and **4** from multipoles 1 and 2, respectively.

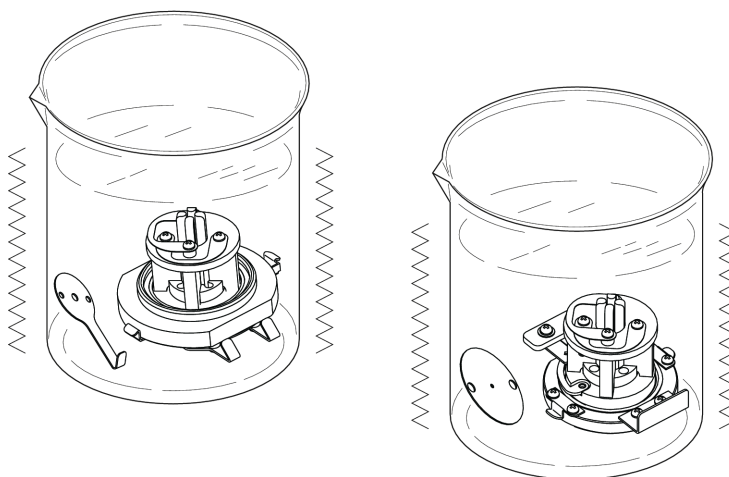


- 2 Wipe off any soiling on the lens inner surface using a wiper impregnated with methanol.

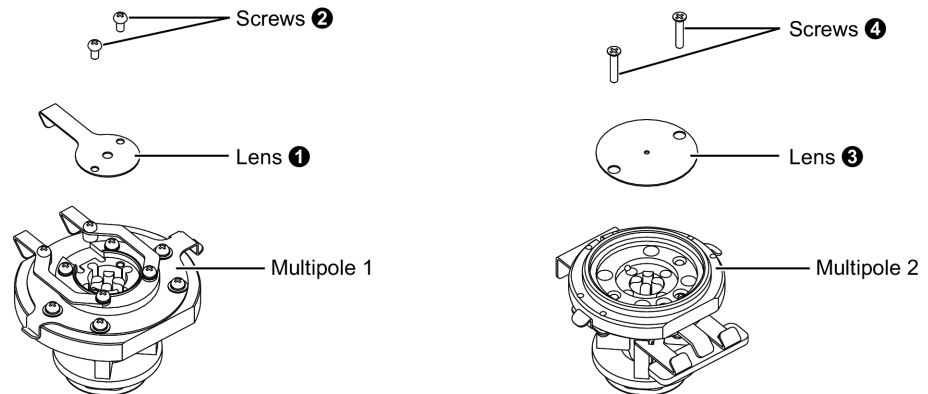


- 3 Immerse the multipoles in methanol and clean them by ultrasonic cleaning (for 10 to 30 minutes).
- 4 Remove the multipoles from the methanol and leave them to air until dry.

▼ **NOTE** Do not use paper towels but allow the multipoles to dry naturally.



- 5 Secure lenses **1** and **3** with the two screws **2** and **4** to multipoles 1 and 2, respectively.



7.5.3 Removing the Qarray

1

Remove the ionization unit.

▶▶ Reference "3.5.2 Removing the ESI Unit" P.66
 "3.6.3 Removing the APCI Unit" P.73

! WARNING



Instruction

Take care because the tip of the corona needle is sharp.



Instruction

The inside of the ionization unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

The inside of the ESI/APCI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.

2

Execute the automatic shutdown of the instrument.

▶▶ Reference "3.2.1 Stopping the Vacuum System" P.53

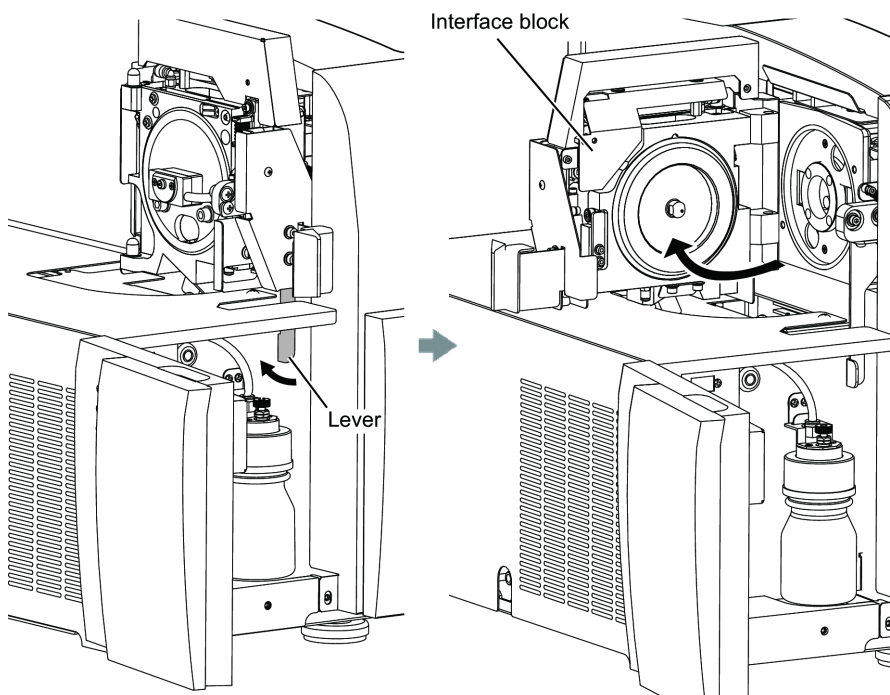


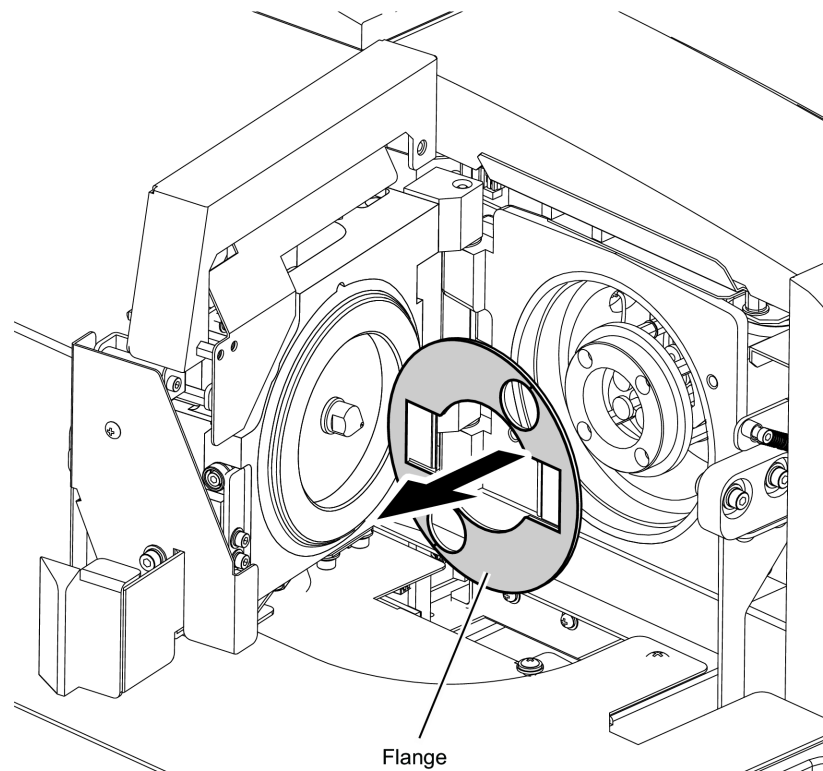
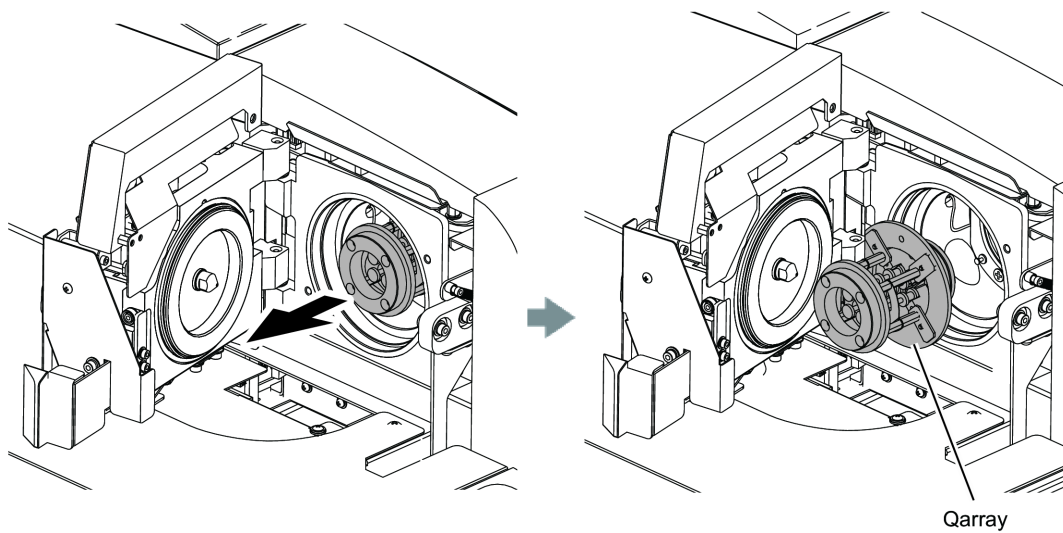
NOTE

The vacuum housing must be opened to atmosphere before opening the door.

3

Pull the lever up and open the interface block.



4**Remove the flange.****5****Draw out the Qarray.****7**

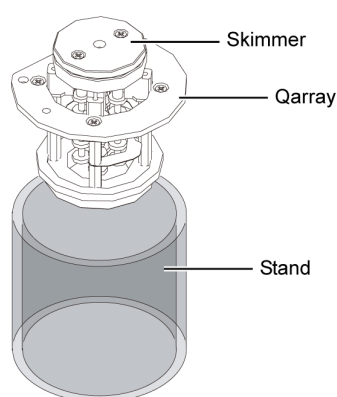
7.5.4 Cleaning the Qarray

! CAUTION

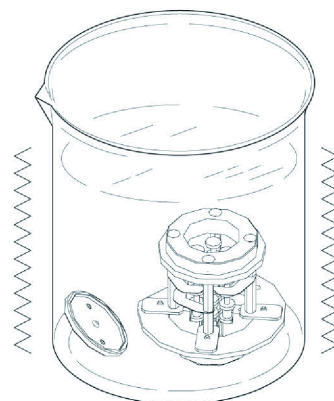
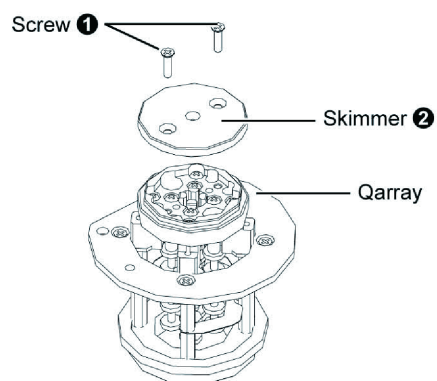
Prohibition

Do NOT disassemble the Qarray body.

Disassembling them could cause injuries and instrument failure.

**NOTE** Rest the Qarray on the stand and then remove the skimmer.**1****Clean the Qarray and skimmer.**

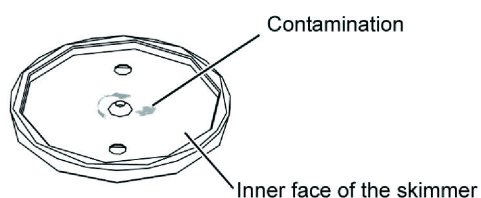
- 1 Remove the two screws **1** and remove the skimmer **2**.
- 2 Immerse the skimmer and Qarray in methanol and subject them to ultrasonic cleaning.



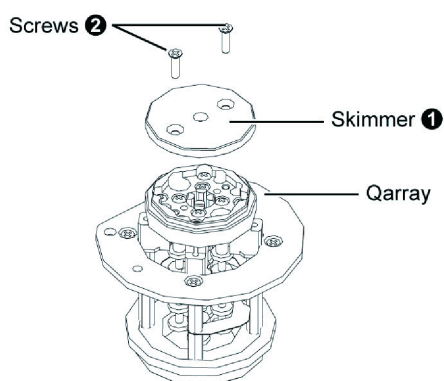
2**Return the parts to their original positions.**

- 1 Dry the parts after cleaning.

▼ **NOTE** If the central part of the inner face of the skimmer is soiled, wipe it clean, e.g. with a cloth. If there is any contamination adhering to the central hole, remove it.



- 2 Mount the skimmer ① and secure it with the two screws ②.

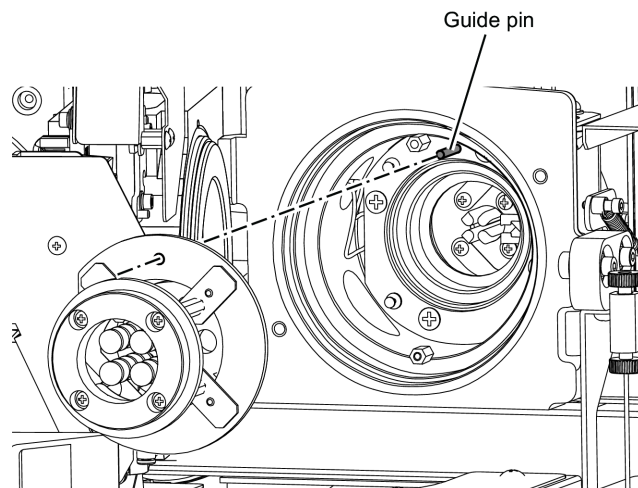
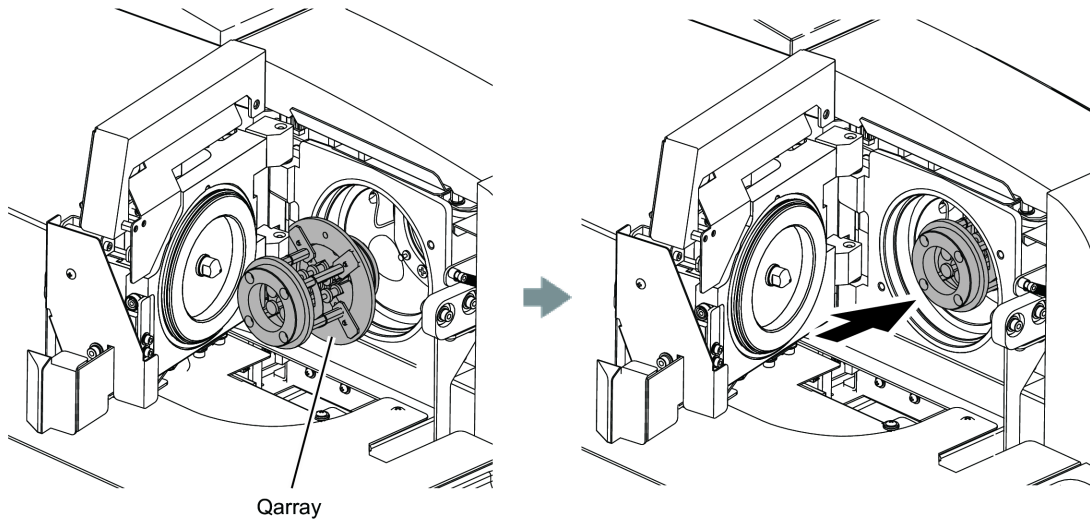


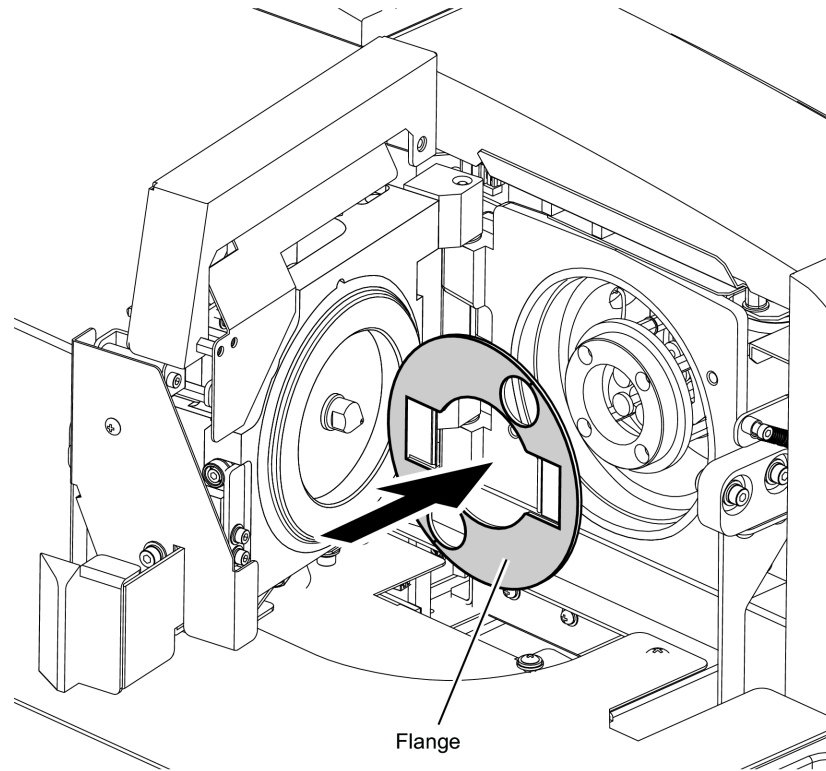
7.5.5 Mounting the Qarray

1

Mount the Qarray by fitting it on the guide pins.

Insert the Qarray all the way in until it slightly pushes back towards you on the springs.

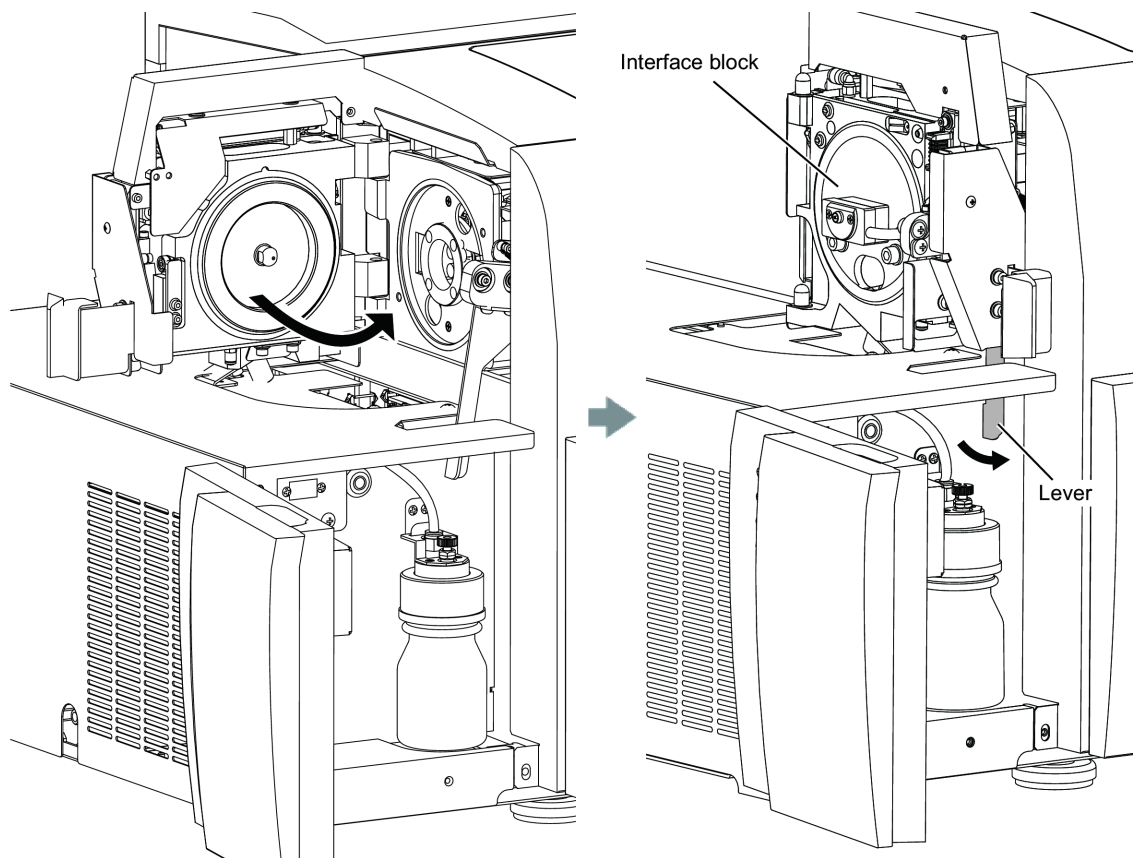


2**Attach the flange.**

Hint The flange will be secured by closing the interface block. Before you do so, the flange may be loose in the forward-backward direction even though it is properly attached.

3

Return the interface block to its original position and close the lever.



4

Mount the ESI and APCI units.

►► Reference "3.5.1 Mounting the ESI Unit" P.62
"3.6.2 Mounting the APCI Unit" P.71

⚠ WARNING



Instruction

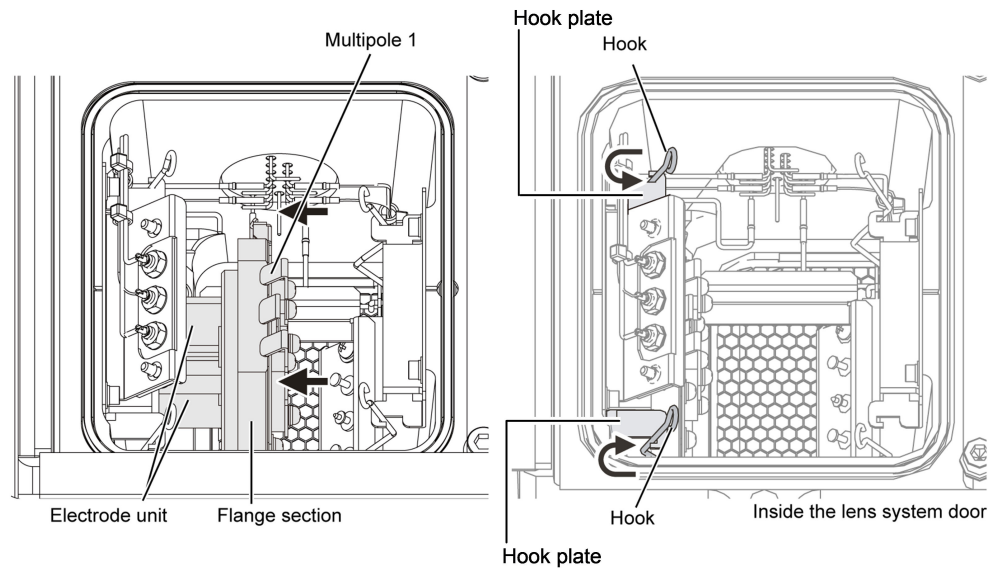
Take care because the tip of the corona needle is sharp.

7.5.6 Mounting the Multipoles

1

Mount multipole 1.

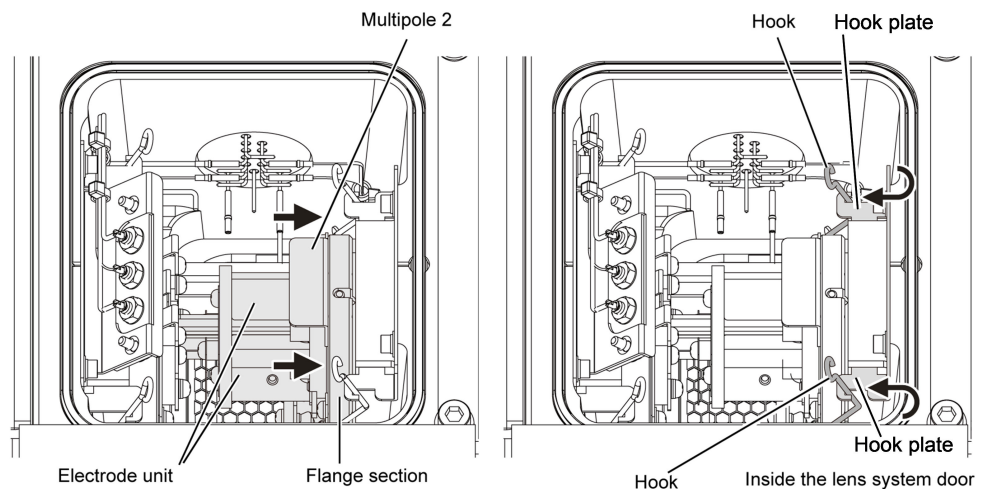
- 1 Hold and slide the flange section and insert multipole 1.
- 2 Attach the hooks at two locations onto the hook plate.



2

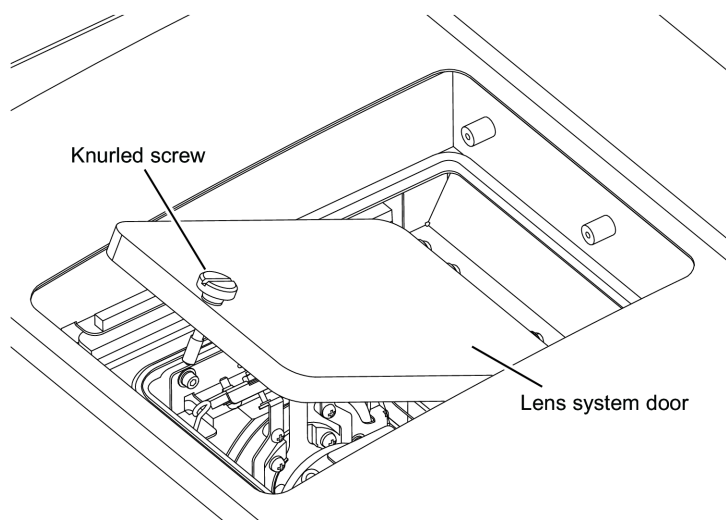
Mount multipole 2.

- 1 Hold the flange section and insert multipole 2 from above.
- 2 Attach the hooks at two locations onto the hook plate.



3**Close the lens system door.**

Close the lens system door and secure it with the knurled screw.



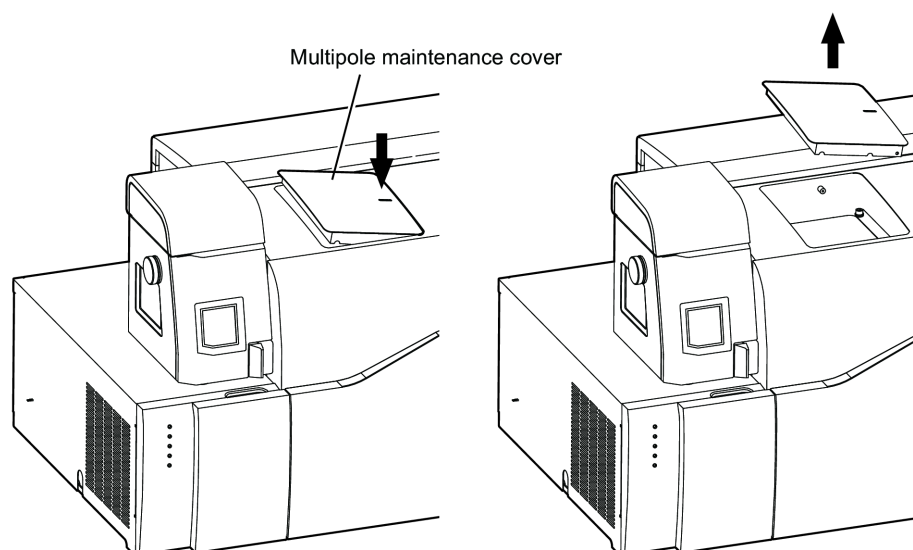
7.5.7 Replacing the O-Ring

1**Stop evacuation and turn the power switch OFF.**

►► Reference ["3.2 Stopping the Instrument" P.53](#)

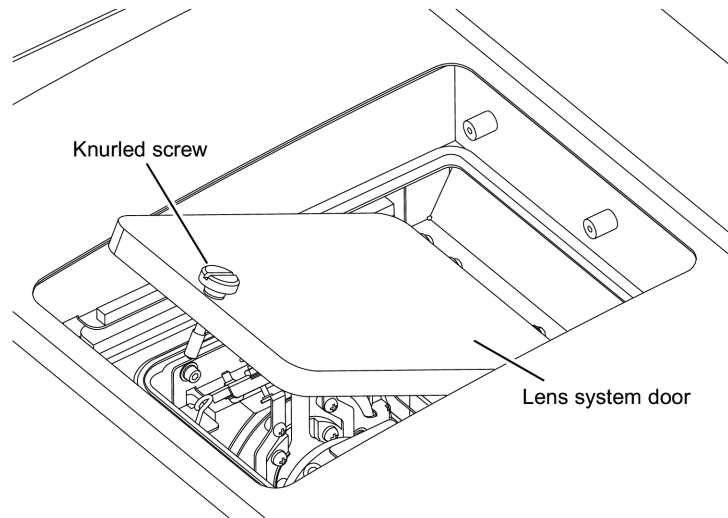
2**Open the multipole maintenance cover.**

- 1 Press the indentation with your finger.
- 2 Lift the entire cover upward to remove it.

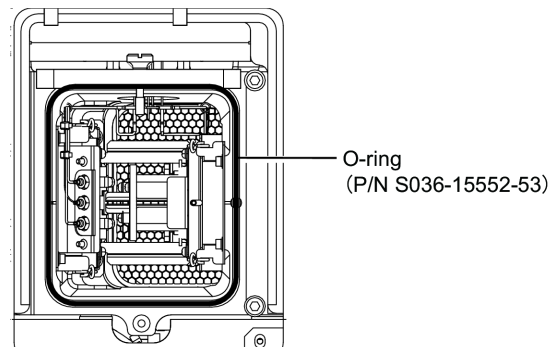


3

Loosen the knurled screw and open the lens system door.

**4**

Remove the O-ring and, if there is any damage, replace it.



NOTE When inserting the O-ring into the groove, make sure that there is no dirt adhering to it.

7

7.6 Maintenance of the Standard Sample Introduction Unit

7.6.1 Replacing the Standard Sample

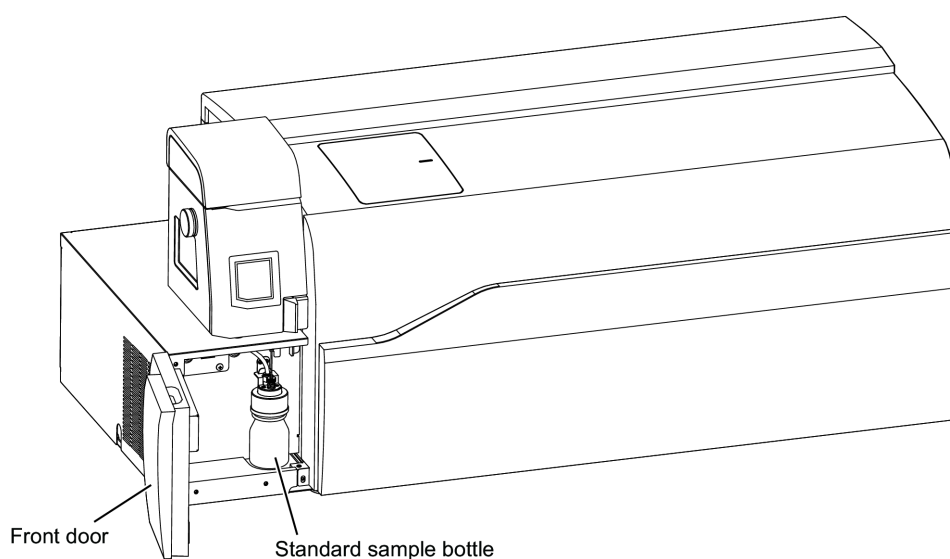
1

Stop pumping the standard sample.

▶▶ Reference "8.2.1 Checking Ions in the [MS Tuning] Window" P.222

2

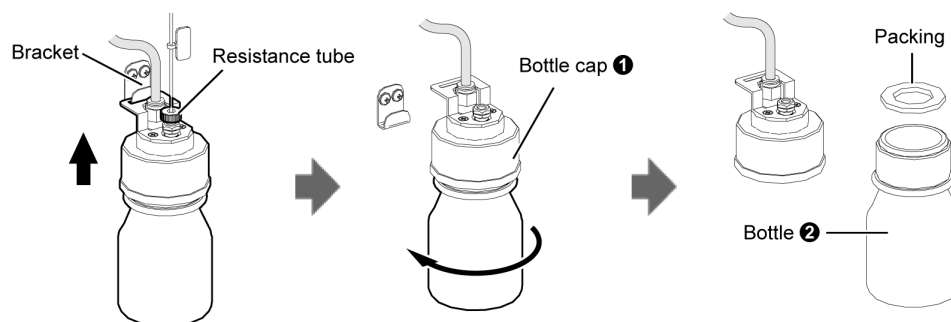
Open the front door.



3

Remove the standard sample bottle.

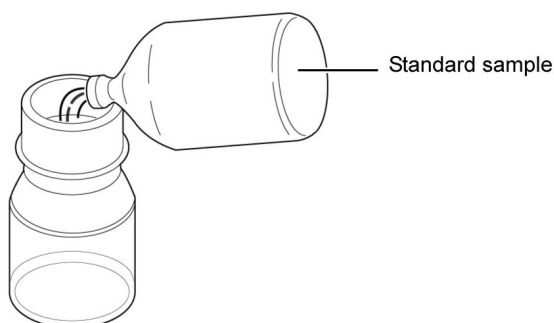
- 1 Disconnect the resistance tube.
- 2 Lift the standard sample bottle up to remove it from the bracket.
- 3 Turn the bottle ② while holding the bottle cap ①.



NOTE When removing the standard sample bottle, take care not to injure yourself on the edge of the bracket.

Hint Some packing may become stuck in the bottle cap.

4

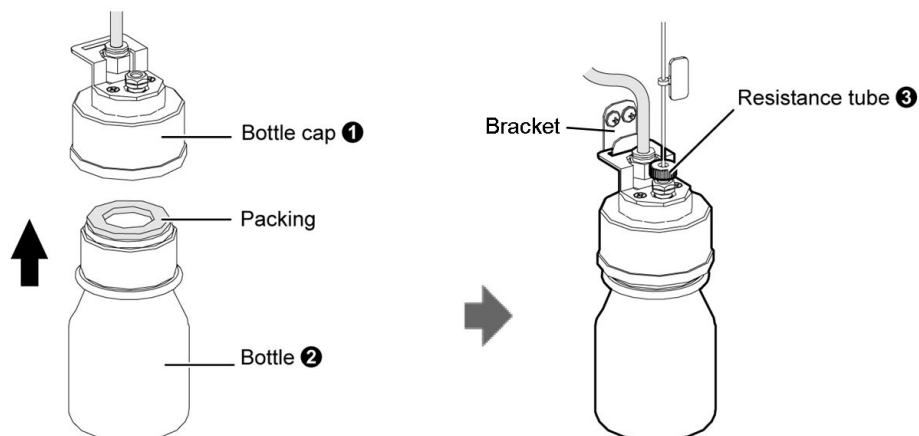
Pour standard sample into the bottle.

NOTE If there is only a little standard sample left in the bottle, throw it away and wash the bottle before pouring in new standard sample. Fill the bottle with at least 40 to 80 mL of standard sample (P/N S225-14122-01) (the highest reading on the bottle's scale corresponds to 80 mL).

▶▶ Reference "8.3 Standard Sample" P.233

5**Return the standard sample bottle to its original position.**

- 1 Attach the bottle cap ❶ to the bottle ❷.
- 2 Fit the standard sample bottle onto the bracket.
- 3 Attach the resistance tube ❸.



- ▼ **NOTE**
- Always ensure there is packing between the bottle and the bottle cap.
 - When mounting the standard sample bottle, take care not to injure yourself on the edge of the bracket.

6**Close the front door.**

7.6.2 Replacing the Resistance Tube

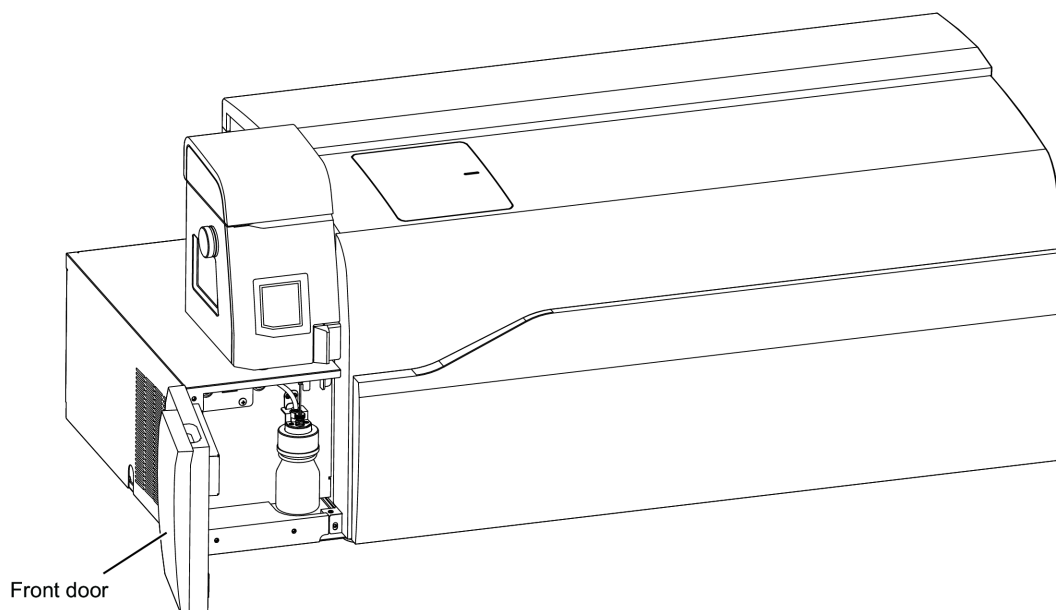
1

Stop pumping the standard sample.

▶▶ Reference "8.2.1 Checking Ions in the [MS Tuning] Window" P.222

2

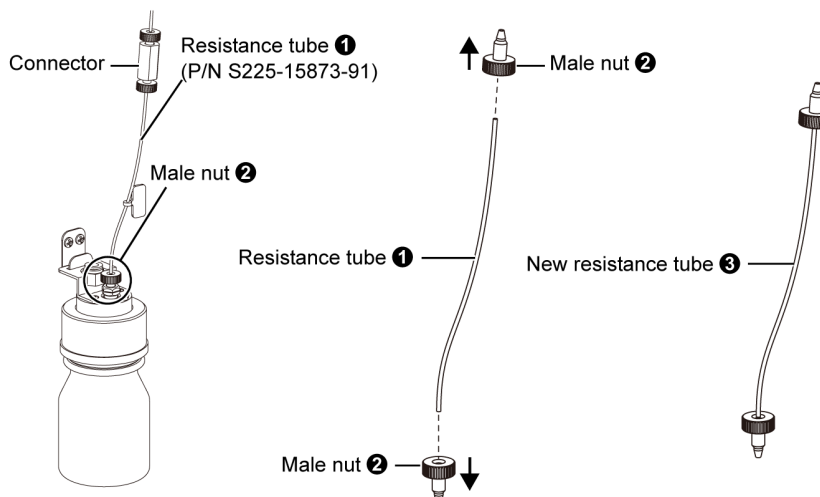
Open the front door.



3

Replace the resistance tube.

- 1 Disconnect the resistance tube ❶.
- 2 Remove the male nuts ❷ from the resistance tube ❶.
- 3 Fit the male nuts ❷ to the new resistance tube ❸.

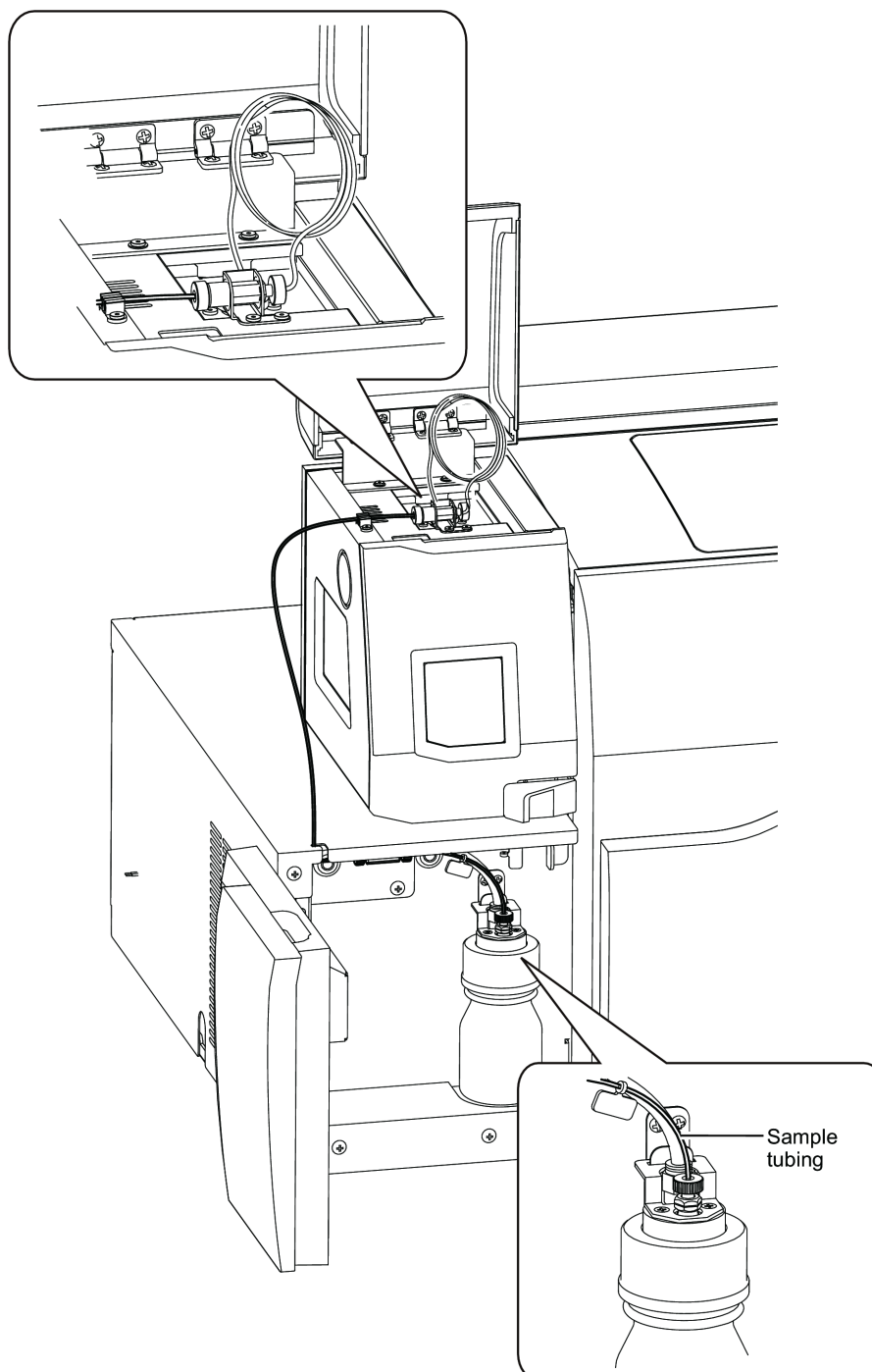


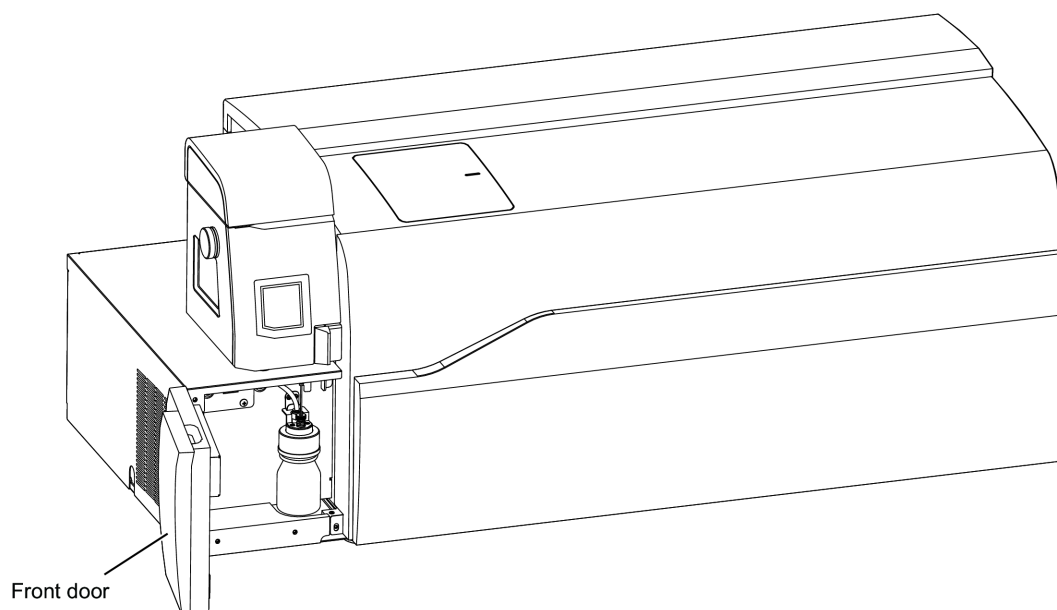
7

4

Fit the resistance tube between the standard sample bottle and the connector.

NOTE Take care not to bend the resistance tube too much.
Maintain a moderate bending radius of at least 40 mm while handling the tube.



5**Close the front door.**

7.6.3 Replacing the Filter

1

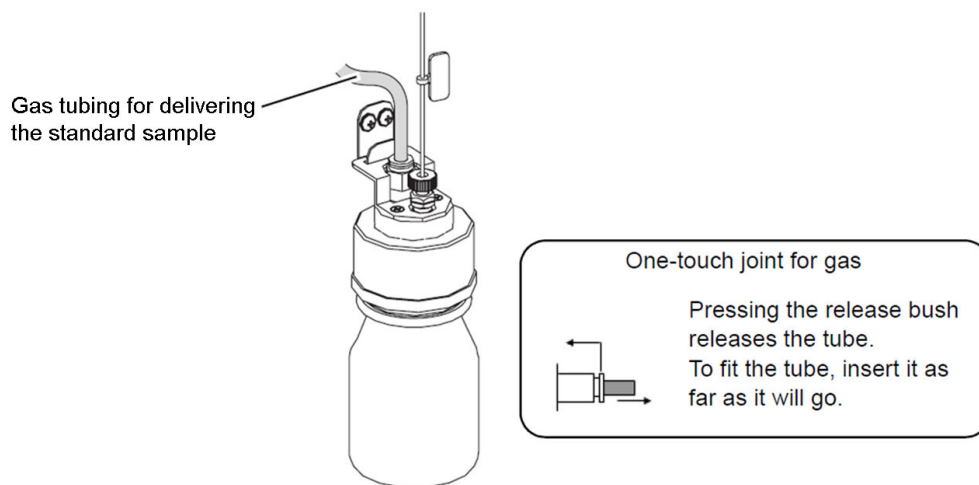
Remove the standard sample bottle from the instrument.

►► Reference "7.6.1 Replacing the Standard Sample" P.162

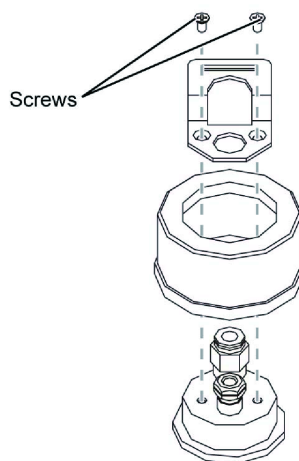
2

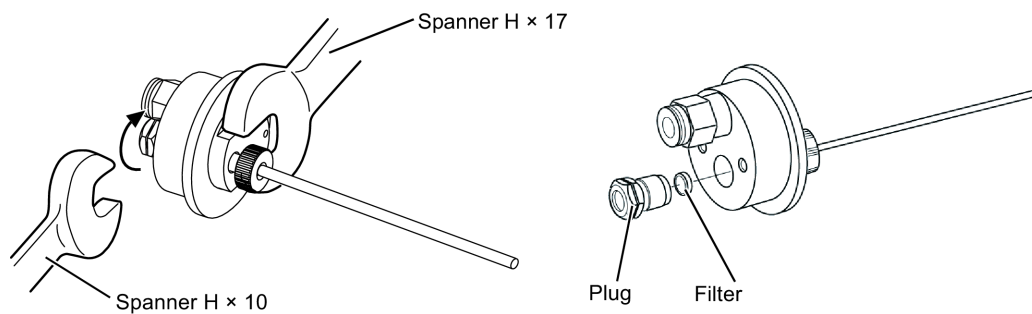
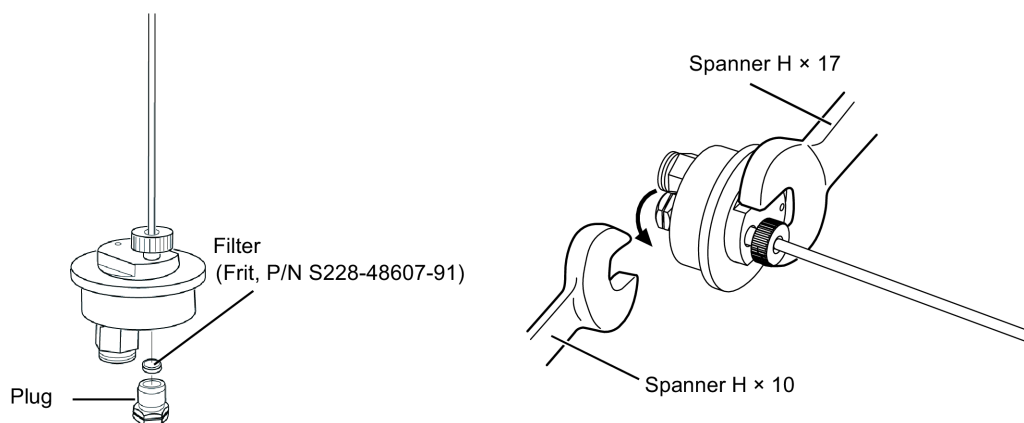
Remove the gas tubing for delivering the standard sample from the standard sample bottle.

The tube can be removed by pressing the release bush of the gas one-touch joint.

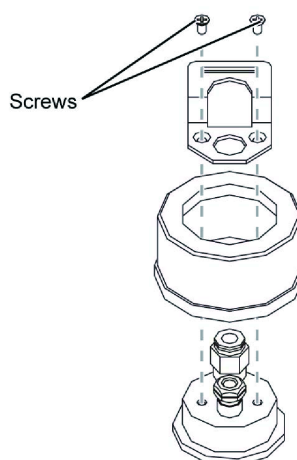
**3**

Remove the two screws and disassemble the parts.



4**Secure the base with a spanner.****5****Replace the filter with a new one and tighten the plug.**

NOTE To tighten the plug, first hand-tighten it and then turn it another 60 to 90 degrees.

6**Tighten the two screws to assemble the parts.****7**

7.7 Replacing the O-ring of the Ionization Unit

If the O-ring of the ionization unit has become damaged or deteriorated, it could lead to solvent leakage.

In such cases it must be replaced.

Parts used

Part Name	Part No.
O-ring, 4D P95	S036-11267

1

Remove the O-ring.

! WARNING

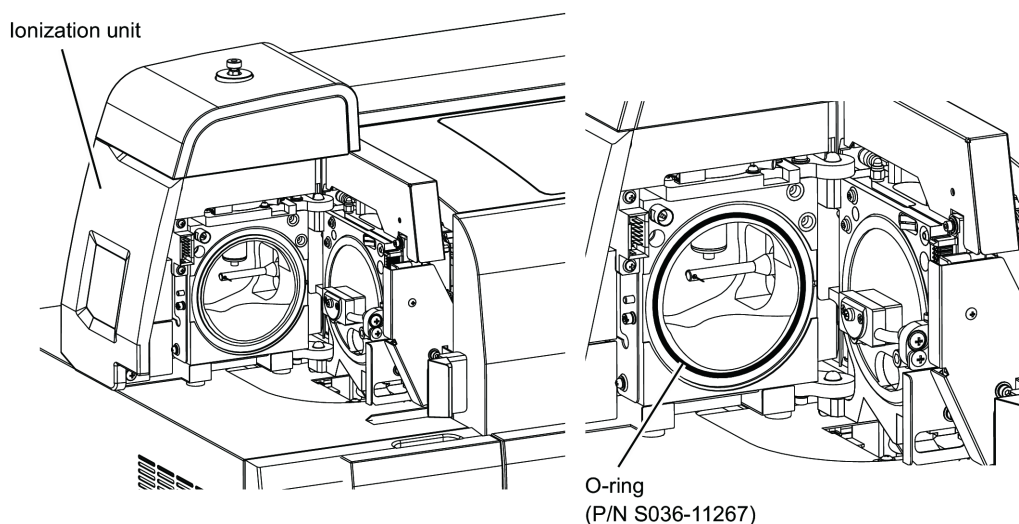


Instruction

The inside of the ionization unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

The inside of the ESI/APCI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.

- 1 Remove the ionization unit.
- 2 Remove the O-ring ③.



2

Fit the new O-ring.



NOTE

When fitting the O-ring, be careful not to damage it or let any dirt adhere to it.

7.8 Cleaning the Spray Unit

Parts used

Part Name	Part No.
Sampling cone	S225-15487
Flat countersunk head screw M3 × 5	S225-14287-41
Drain guard	-

If soiling cannot be removed, replace the part.

1

Remove the ionization unit.

With APCI or DUIS, remove the corona needle.

- ▶▶ Reference "3.5.2 Removing the ESI Unit" P.66
 "3.6.3 Removing the APCI Unit" P.73
 "3.6.4 Removing the Needle Unit" P.75
 "3.7.2 Removing the Needle Unit" P.80

! WARNING



Instruction

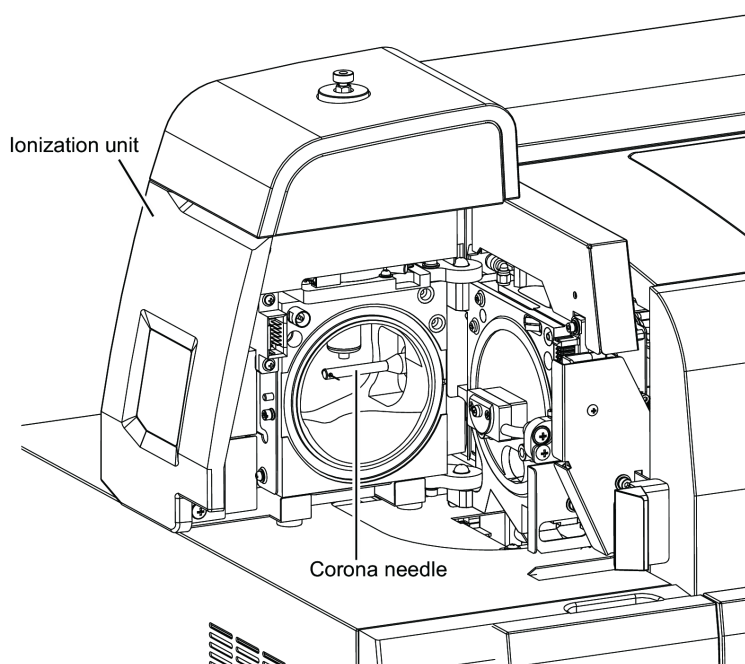
Take care because the tip of the corona needle is sharp.



Instruction

The inside of the ionization unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

The inside of the ESI/APCI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.



7

■ Routine inspection

1

Wipe off soiling.

Moisten gauze with a solvent that can remove soiling (such as water/methanol) and wipe the soiling off with the gauze.

Clean the locations indicated below.

- Sampling cone
- Heat block
- Heater flange
- Inside wall of the ionization unit
- Tip of the ionization unit

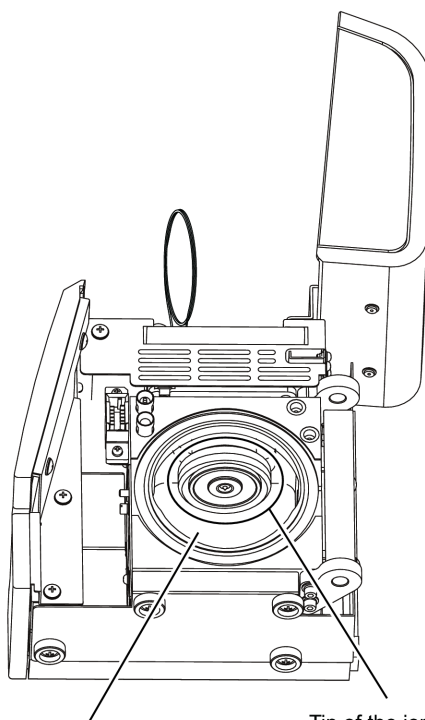
! CAUTION

Instruction

Before wiping the tip of the ESI unit, be sure to adjust the projection length of the ESI capillary to less than 0 mm.

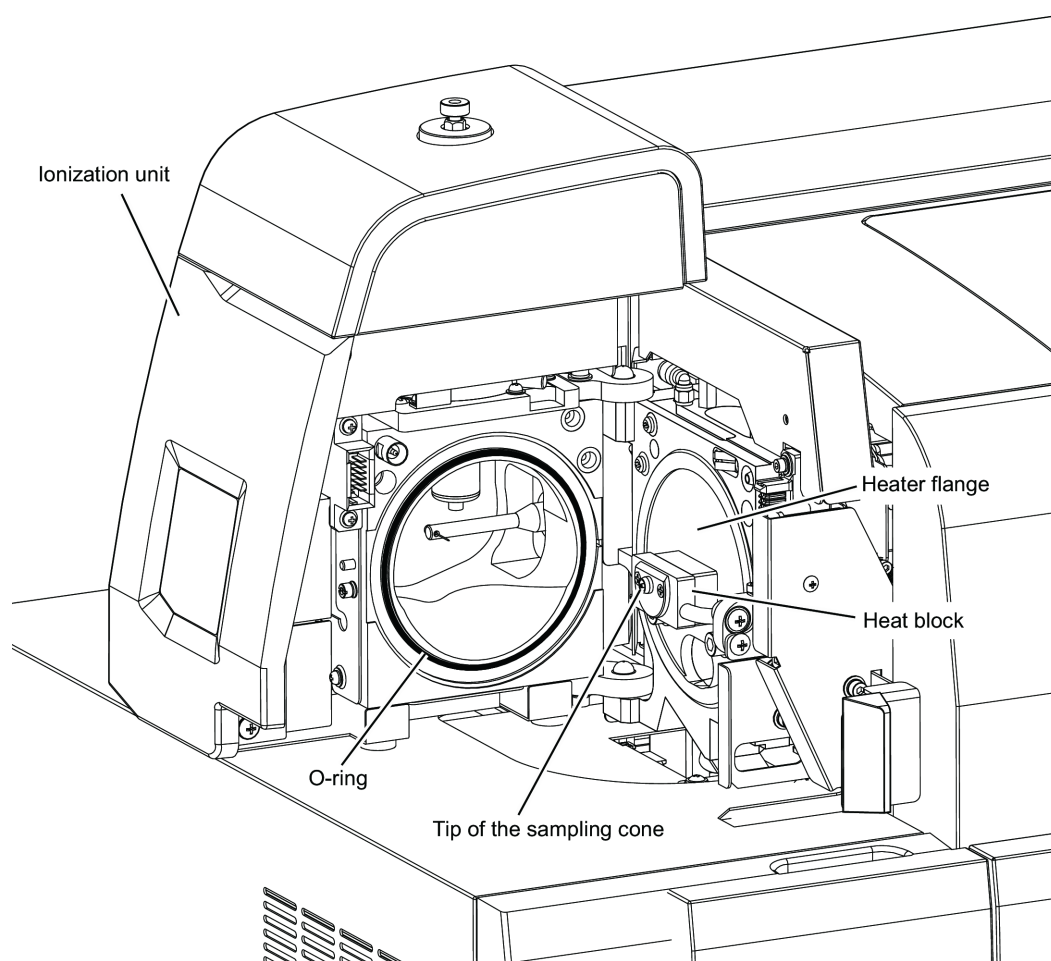
If the ESI capillary projects at all, the tip of the capillary may stick into your fingers during the work.

Contact with fingers may also reduce sensitivity.



Inside wall of the ionization unit

Tip of the ionization unit



NOTE Do not clean the tip of the DL since this can cause blockage of the tubing. If the tip of the DL is badly soiled, replace the DL.

▶▶ Reference ["7.9.1 Removing the DL from the Instrument" P.176](#)

■ If the soiling is severe:

1

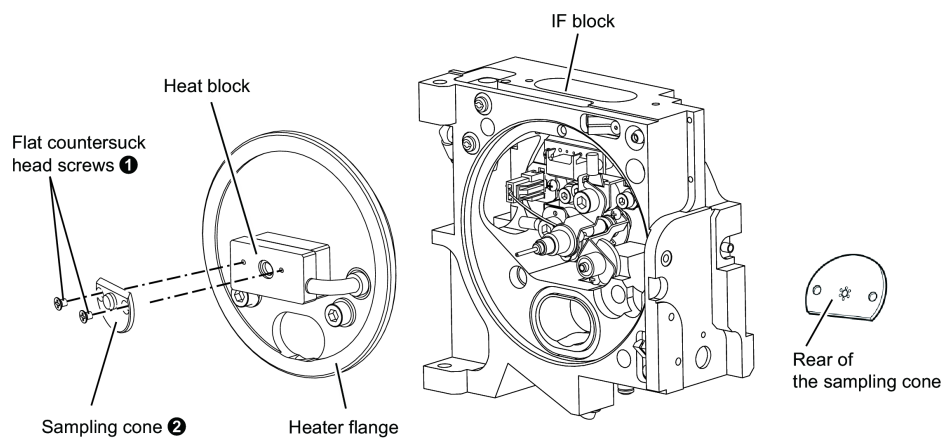
Clean the parts.

▼ **NOTE** Before removing the sampling cone, be sure to remove the heater flange first. Be careful not to drop the sampling cone when removing it.

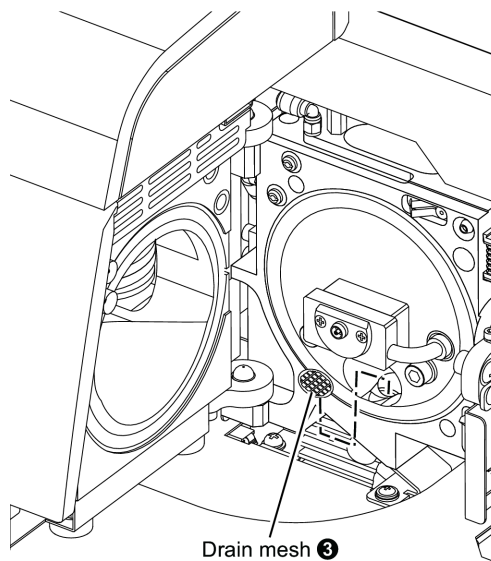
- 1 Remove the heater flange.
- 2 Remove the two flat countersunk head screws ❶ and remove the sampling cone ❷.

▼ **NOTE** Remove the flat countersunk head screws only after the temperature drops to around room temperature in order to prevent damage to the screws.

- 3 Wipe the rear of the sampling cone. Moisten gauze with a solvent that can remove soiling (such as water/methanol) and wipe any soiling off with the gauze. If the heat block is soiled, scrub it with a nylon brush and then wipe it clean with gauze moistened with a solvent that can remove the soiling (such as water/methanol).

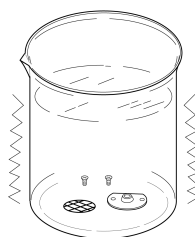


- 4 Remove the drain mesh ❸. Lift it up with tweezers.



- 5 Subject the sampling cone, flat countersunk head screws and drain mesh to ultrasonic cleaning in a methanol solution.

 **Hint** If the soiling is particularly bad, polish the parts with about 4-micron lapping film.



2

After drying the parts, mount them in the instrument.

 **NOTE** When mounting the parts, check if there is any foreign body in the hole of the sampling cone, and if there is any cleaning fluid left on the parts. If there is a foreign body it may cause blockage of the DL.

7

7.9 Replacing the DL

WARNING



Instruction

Before starting maintenance work, turn the heater OFF from the LabSolutions program and make sure that the temperature of the heat block has fallen to 50 °C or lower.

The spray unit reaches high temperatures and could cause burns.

Parts used

Part Name	Part No.
DL ASSY2	S225-15718-42

7.9.1 Removing the DL from the Instrument

1

Unlock and remove the ionization unit ①.

If using APCI or DUIS, remove the corona needle too.

- ▶▶ Reference
- "3.5.2 Removing the ESI Unit" P.66
 - "3.6.3 Removing the APCI Unit" P.73
 - "3.6.4 Removing the Needle Unit" P.75
 - "3.7.2 Removing the Needle Unit" P.80

WARNING



Instruction

Take care because the tip of the corona needle is sharp.



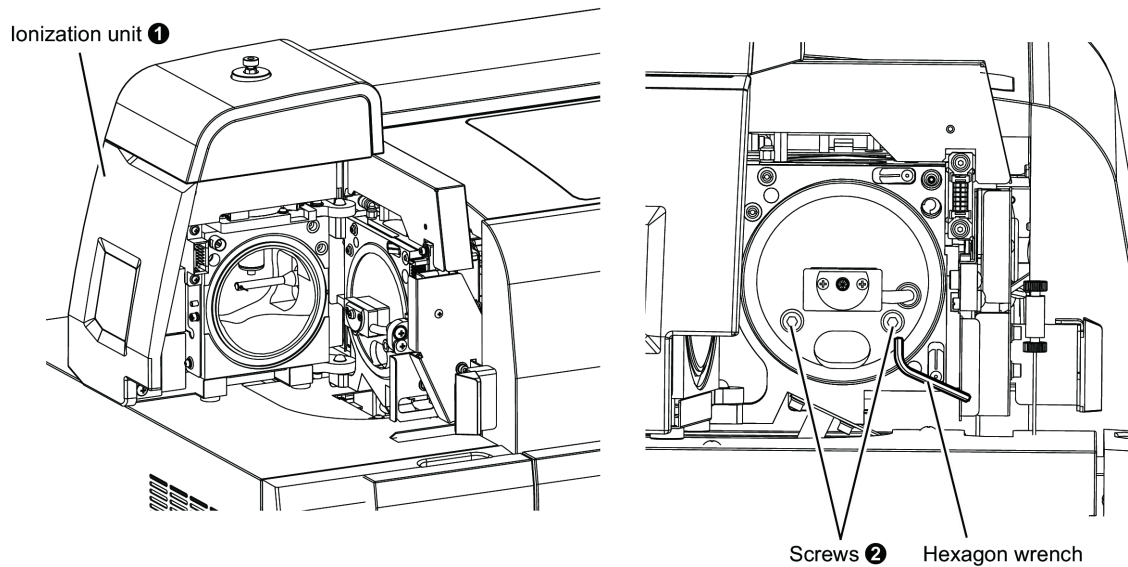
Instruction

The inside of the ionization unit reaches high temperatures and you must wait until the temperature has decreased sufficiently before starting work.

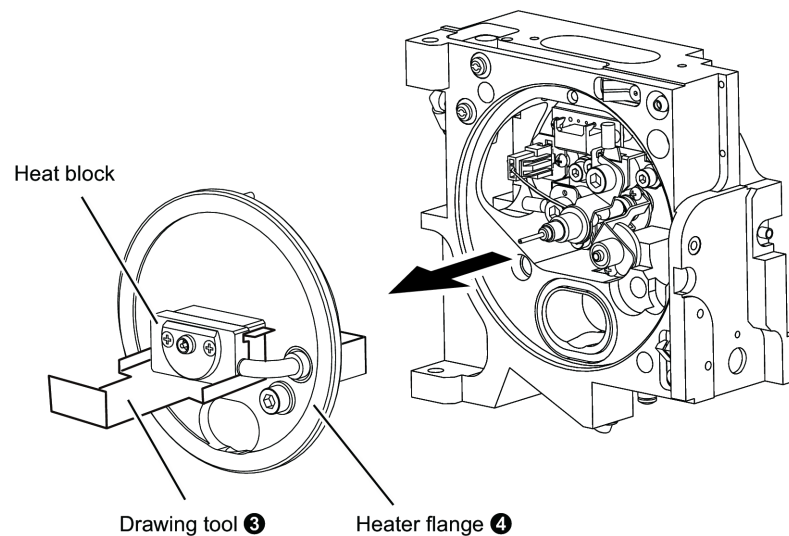
The inside of the ESI/APCI unit, DL, and heat block reach high temperatures. Do not start work before the temperature goes down sufficiently. Otherwise, you could get burned.

2

Loosen the two screws ② with the hexagon wrench provided as an accessory.

**3**

Insert the drawing tool ③ provided as an accessory under the heat block and remove the heater flange ④.

**4**

Disconnect the connector ⑤.

Press in the catches on the connector as you remove it.

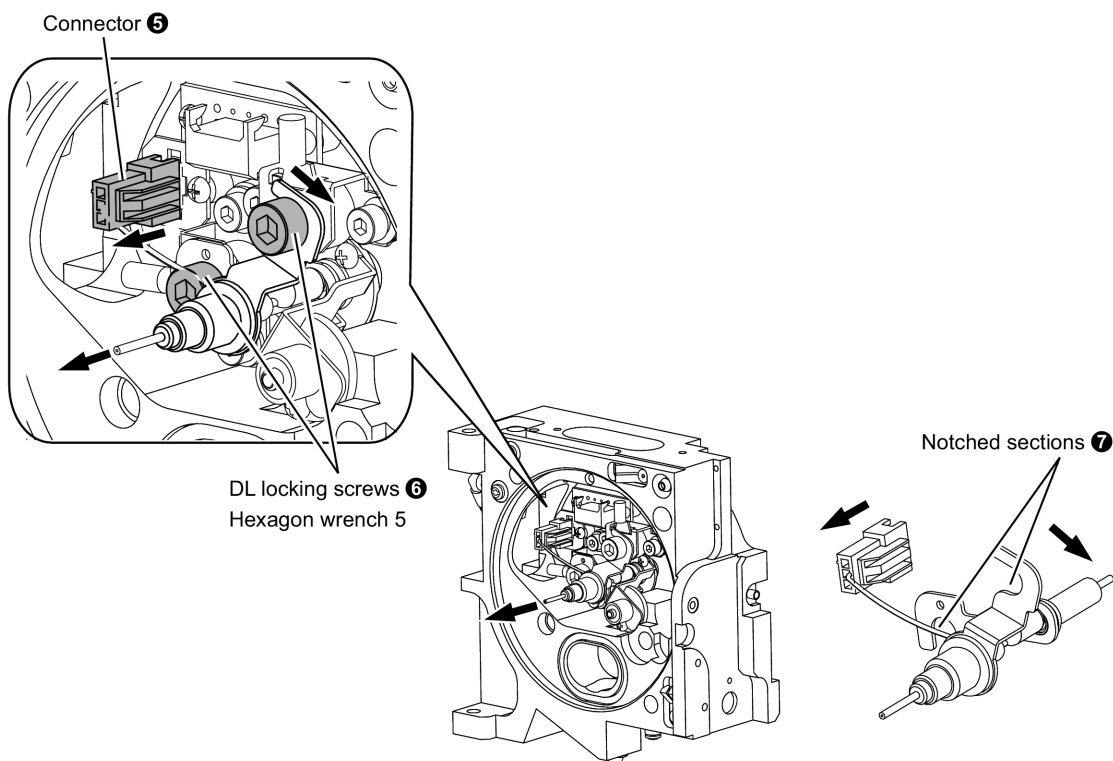
5

Loosen the two DL locking screws ⑥ with the hexagon wrench provided as an accessory.

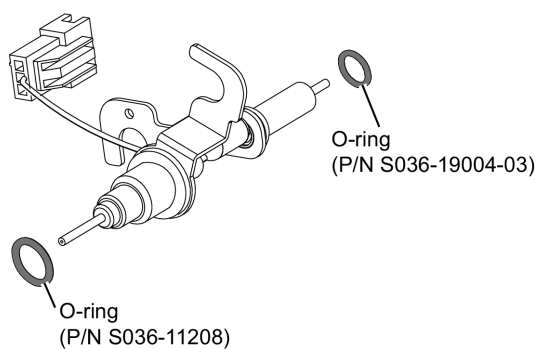
Turn the hexagon wrench about three turns.

6

Turn the notched section ⑦ to the direction in which the DL is to be removed, then draw it out.



Hint The triple inlet turbo molecular pump changes to standby mode when the DL is removed. The pump returns to normal mode about 3 minutes after mounting the DL (connector ⑤).



NOTE If there is any damage to the O-ring (part number S036-11208, S036-19004-03), replace it.

7.9.2 Mounting the DL in the Instrument

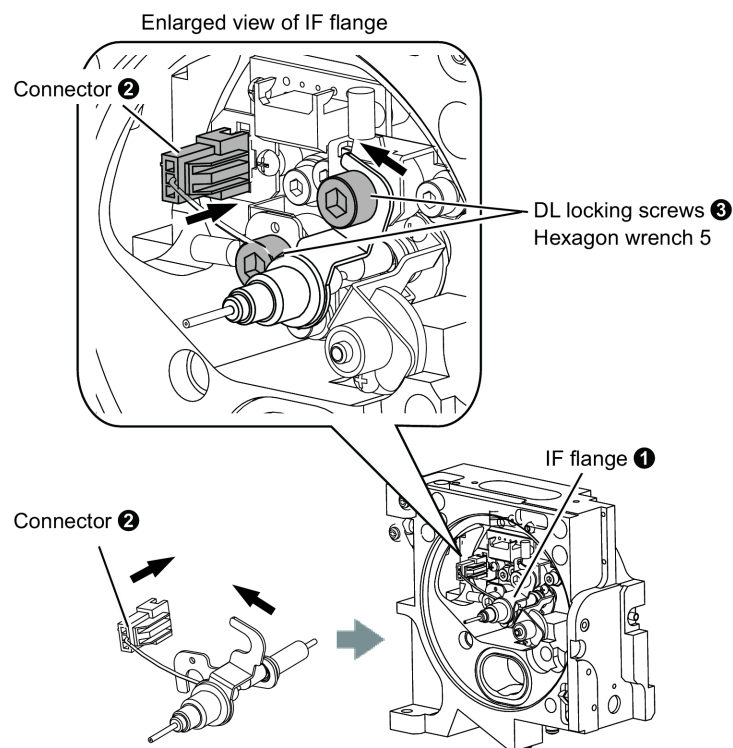
1

Turn the notched section in the direction in which it engages (i.e., counterclockwise) to secure the DL to the IF flange **1**, then connect the connector **2**.

2

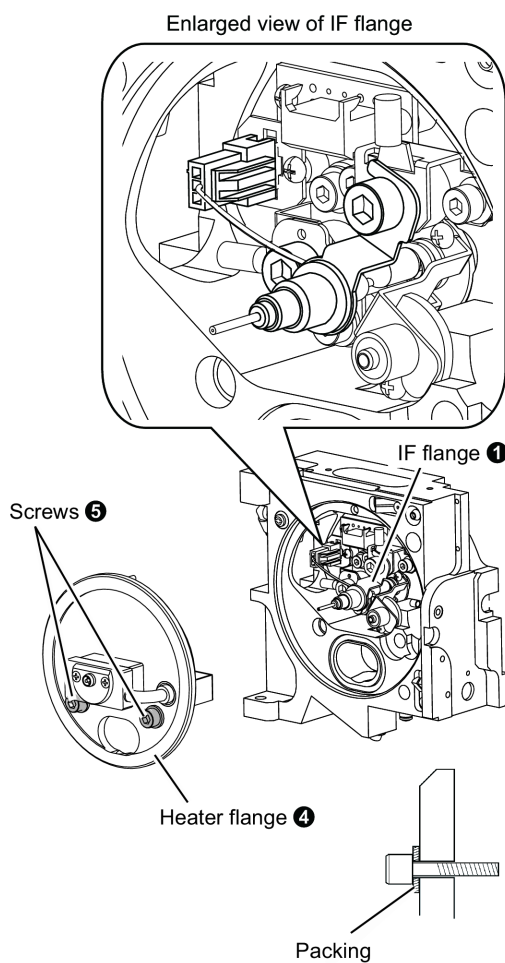
Tighten the two DL locking screws **3** with the hexagon wrench provided as an accessory.

Tighten the locking screws sufficiently.



3

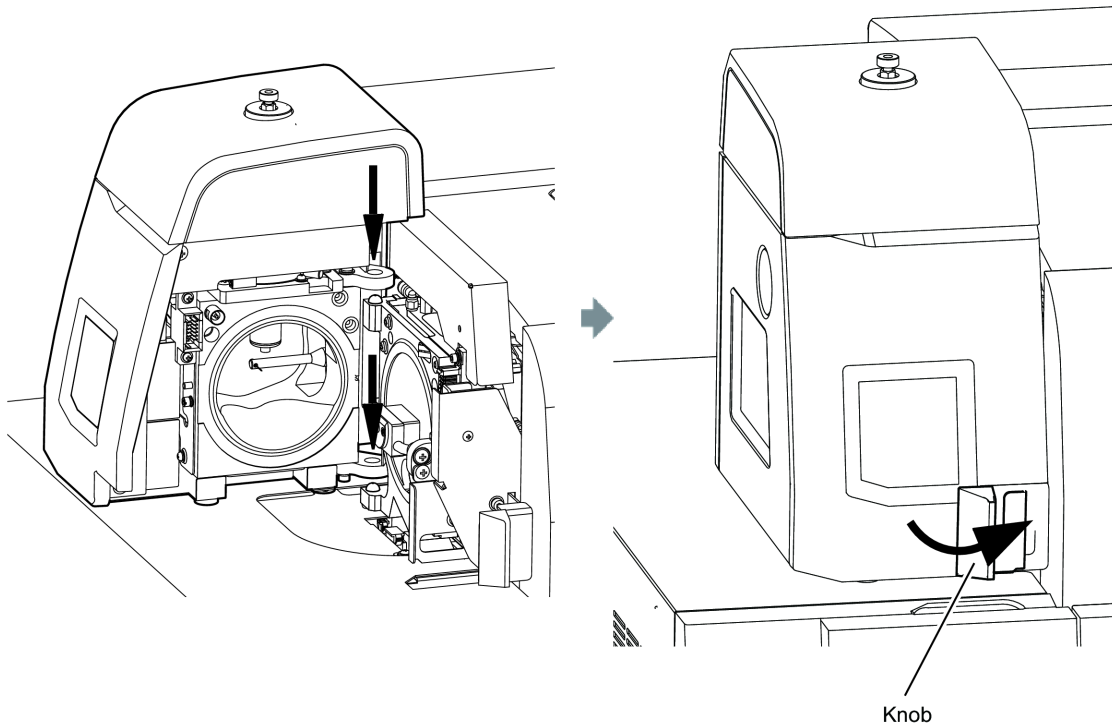
Insert the heater flange ④ into the IF flange ① and tighten the two screws ⑤. Use the drawing jig to insert the heater flange.



▼ **NOTE** When mounting the heater flange, take care about the positioning of the top and bottom of the flange.

4

Mount the ionization unit.

5**Lock the ionization unit by sliding its knob.**

7.10 Cleaning and Replacing the Orifice

WARNING



Instruction

Stop the vacuum system and turn the instrument power switch OFF before starting maintenance work.

If you do not turn the power switch OFF there will be a danger of electric shock.



Instruction

Before starting maintenance work, turn the heater OFF from the LabSolutions program and make sure that the temperature of the block has fallen to 50 °C or lower.

The spray unit and interface section reach high temperatures and could cause burns.

Parts used

Part Name	Part No.
Orifice	S225-15479

7.10.1 Removing the Orifice from the Instrument

1

Stop the vacuum.

▶▶ Reference ["3.2.1 Stopping the Vacuum System" P.53](#)

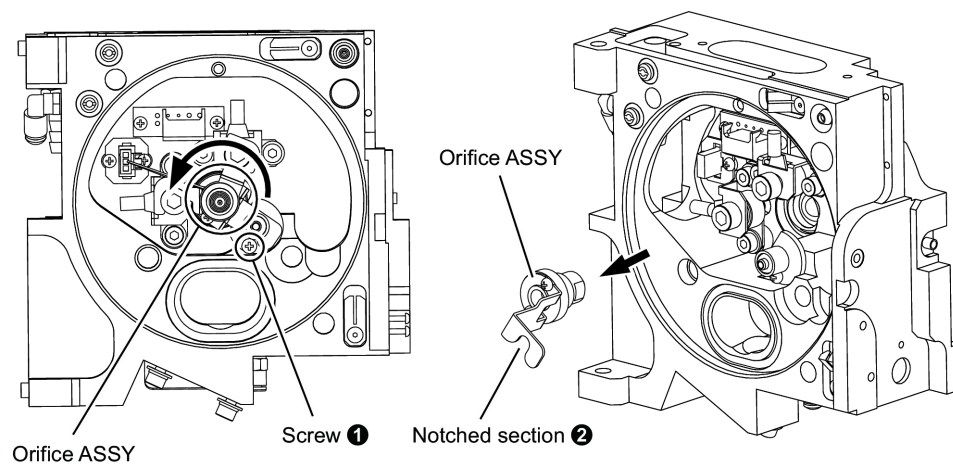
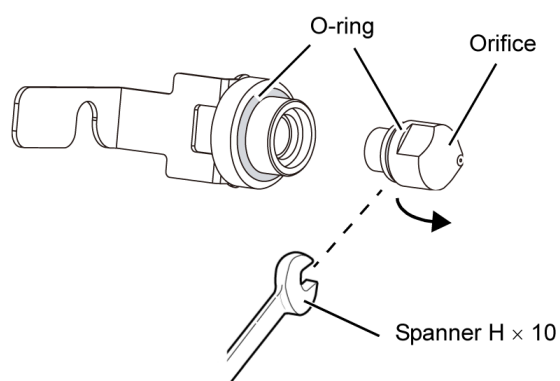
2

Remove the DL.

▶▶ Reference ["7.9.1 Removing the DL from the Instrument" P.176](#)

3**Remove the orifice ASSY.**

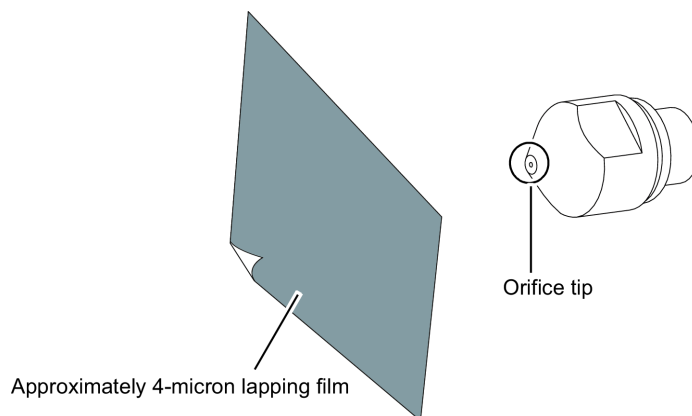
- 1 Loosen the single screw ❶.
- 2 Turn the notched section ❷ in the direction indicated by the arrow and remove the orifice ASSY.

**4****Turn the orifice with a spanner and remove it.**

7.10.2 Cleaning and Assembling the Orifice

1

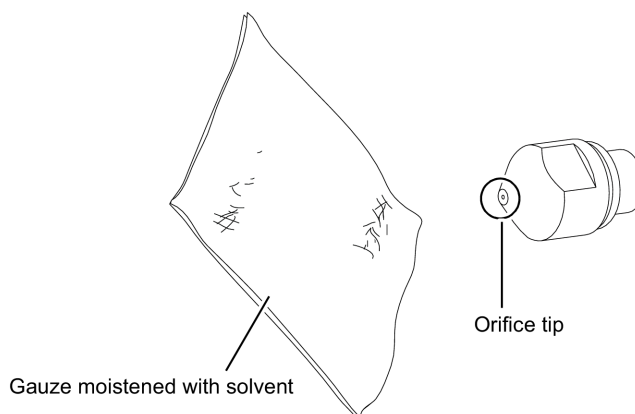
Use approximately 4-micron lapping film to clean and polish the tip of the orifice until you can see its metal surface.

**2**

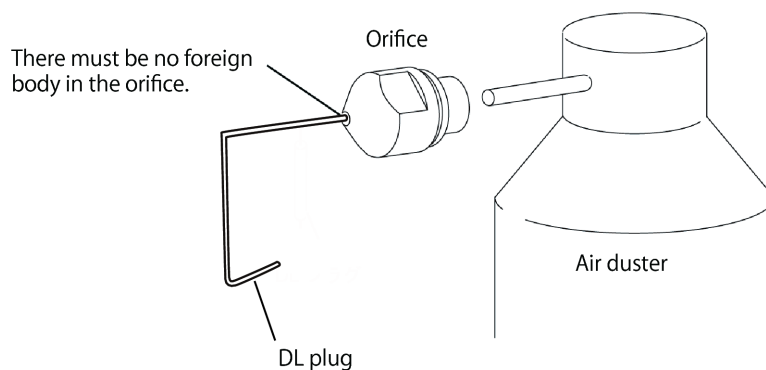
Wipe off any soiling on the orifice tip using solvent.

Moisten gauze with a solvent that can remove soiling (such as water/methanol) and wipe any soiling off with the gauze.

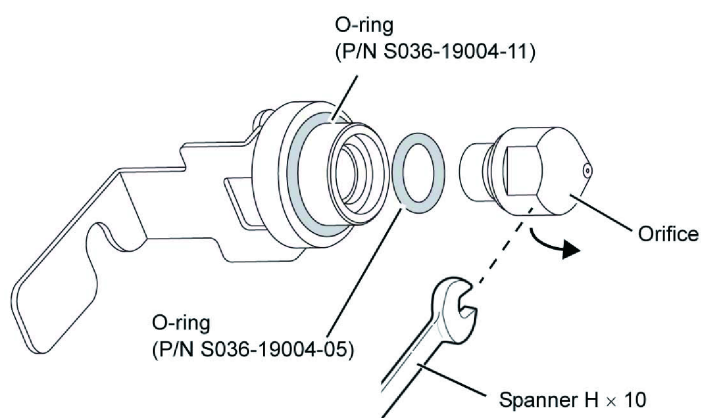
 **Hint** If the orifice is severely soiled, treat it with ultrasound cleaning and then wipe off the dirt.

**3**

Dry the orifice parts.

4**Check that there are no foreign bodies in or around the orifice.**

NOTE If there is a foreign body in the orifice, use the provided "DL plug" and the air duster to remove it.

5**Turn the orifice with a spanner to tighten it.**

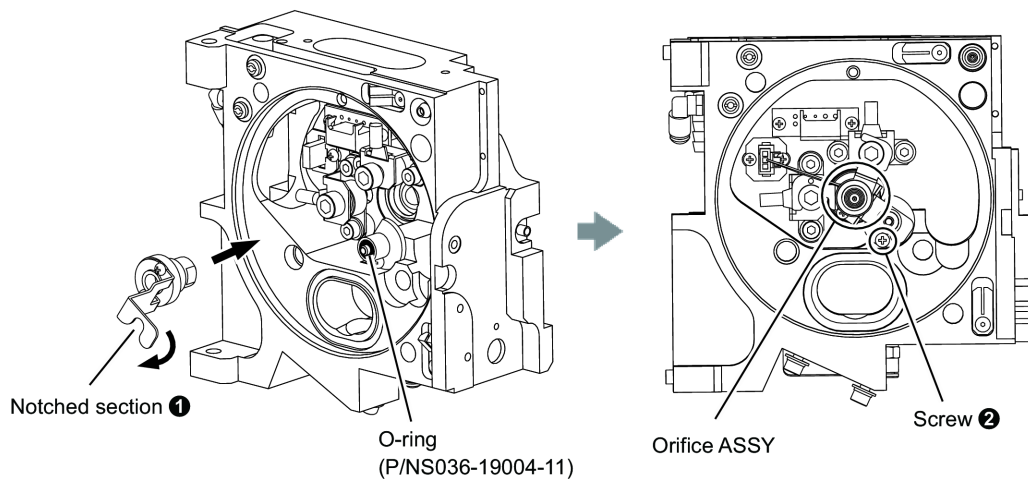
NOTE Refit the O-ring if it has come loose from the orifice. Replace the O-ring if it is damaged in any way.

7

7.10.3 Mounting the Orifice in the Instrument

1**Mount the orifice ASSY.**

- 1 Mount the orifice ASSY and turn the notched section ❶ in the direction indicated by the arrow.
- 2 Tighten the single screw ❷.



NOTE If the O-ring (P/N: S036-19004-11) is damaged, replace it.

2**Mount the DL.**

▶▶ Reference ["7.9 Replacing the DL" P.176](#)

3**Start the vacuum.**

▶▶ Reference ["3.1.2 Starting the Vacuum System" P.45](#)

7.11 Maintenance of the Rotary Pump

WARNING



Instruction

The rotary pump can reach high temperatures. Wait until it cools down before starting work.

Immediately after the rotary pump stops, its surface and inside temperature will be high. The heat can burn you. Wait until the temperature has gone down before starting work.



Instruction

Stop the vacuum system and turn the instrument power switch OFF before starting maintenance work.

If you do not turn the power switch OFF there will be a danger of electric shock.

■ Rotary pump oil change

The rotary pump (type E2M28) that is used as the auxiliary pump for this product's vacuum system requires an oil change every four months. Failure to change the oil will cause trouble including vacuum deficiency, oil leaks and increased noise; it is therefore essential to perform oil changes.

Use an oil whose characteristics are matched to the model of the pump and which is authorized by Shimadzu.

Parts used

Part Name	Part No.
Rotary pump oil Ultragrade19 (4 L container)	S017-30163-02

WARNING



Instruction

Change the oil in response to change in its color and in its volume.

It may be necessary to change the oil more frequently than at four-month intervals, depending on the conditions of use and frequency of use of the instrument.

7.11.1 Changing the Oil

▼ **NOTE** Immediately after stopping the instrument the rotary pump oil will be at a high temperature (approximately 30 °C above room temperature), so you must wait 10 minutes before changing the oil.

1

Stop the instrument.

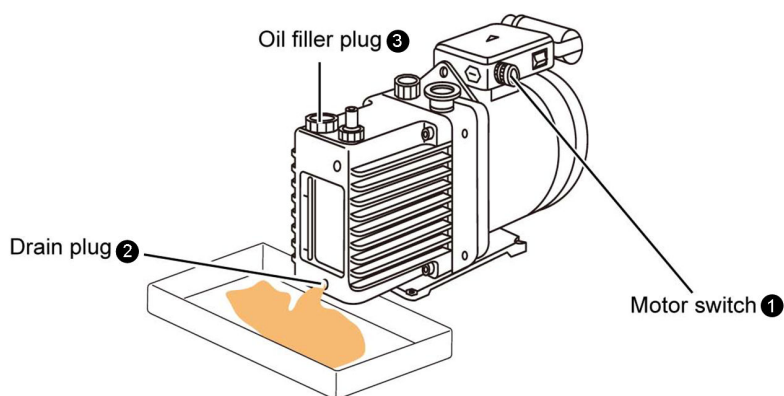
▶▶ **Reference** ["3.2 Stopping the Instrument" P.53](#)

2

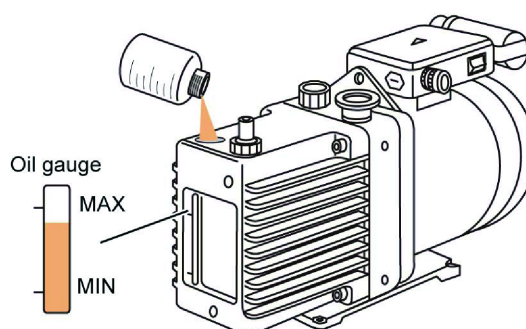
Wait about 10 minutes after stopping it.

3 Inject the new oil.

- 1 Turn the motor switch of the rotary pump ❶ OFF.
- 2 Remove the drain plug ❷.
Drain the oil while receiving it in a tray or plastic bag with a capacity of about 2 L. Note that oil may spray out when the drain plug ❷ is removed, so care is required.
- 3 When oil has stopped coming out of the drain port, close the drain plug ❷.
- 4 Remove the oil filler plug ❸.



- 5 Pour in new oil up to the bottom of the MAX indication of the oil gauge (approximately 1.5 L).

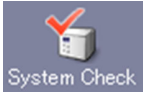


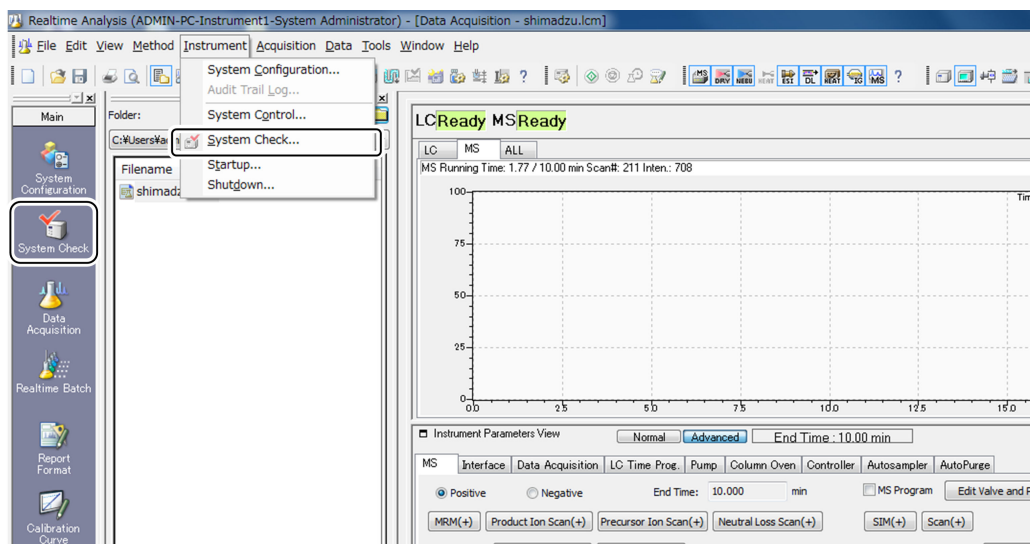
4 Close the oil filler plug.

5 Turn the motor switch of the rotary pump ON.

6

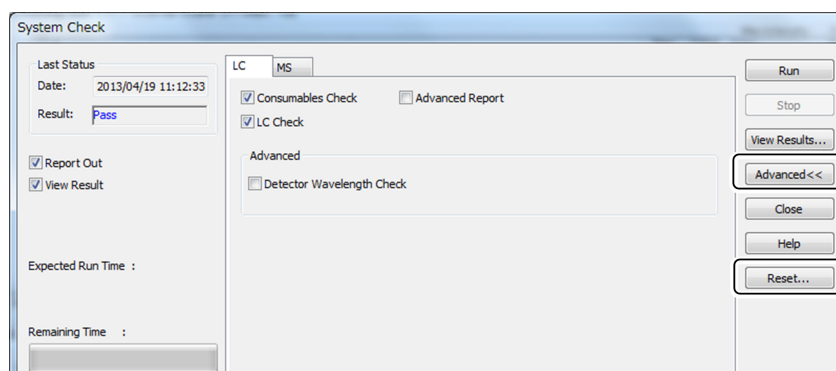
Reset the rotary pump oil change frequency.

- 1 Click the  (System Check) icon.



Hint Alternatively, select [Instrument] - [System Check...].
The [System Check] window is displayed.

- 2 Click [Reset...].
If [Reset...] is not displayed, click [Advanced>>].



- 3 Enter the rotary pump oil use time (set to 0 after an oil change) and click [Set].

The screenshot shows a 'Consumable Reset' dialog box with two tabs: 'LC' and 'MS'. The 'MS' tab is active, displaying 'MS(LCMS-8050)'. Below this, the label 'Rotary Pump Oil Operating Time :' is followed by a text input field containing '0' and the unit 'hr'. A 'Set' button is positioned to the right of the input field. At the bottom right of the dialog box is a 'Close' button.

- 4 Click [Close].

7.11.2 Gas Ballast Valve

! CAUTION

Instruction

Under normal conditions of use, open the gas ballast valve once a week for around 15 to 30 minutes to remove the contaminants in the oil.

If the water content ratio of the mobile phase is high or the flow volume is large, open the gas ballast valve once every 1 to 3 days.

When you open the valve, a large quantity of oil mist will emerge from the exhaust port. Make sure that the exhaust gas is always released into a duct system.

If the oil mist filter is mounted and oil has accumulated in the filter, open the gas ballast valve to return the oil to the rotary pump.

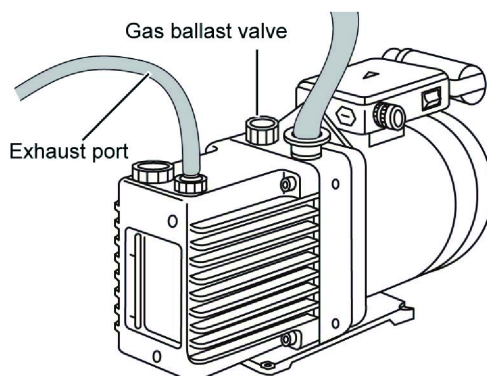
Since a large quantity of mobile phase and water is taken into the rotary pump in the instrument, using it over a long period of time without opening the gas ballast valve will cause deterioration in exhaust performance and instrument failure.

1

Open the gas ballast valve and wait 15 to 30 minutes.

**NOTE**

Turn the gas ballast valve counterclockwise approximately 7 turns to fully open the valve.

**2**

Close the gas ballast valve.

**NOTE**

Apart from the oil changes described above, the rotary pump is also subject to some checks in periodic inspections.

For details on these checks, refer to 5 "Maintenance" in the separately attached E2M28 instruction manual (A373-10-880).

7.12 Vacuum Leak Check

Running the instrument while there is a vacuum leak will lead to problems such as reduced sensitivity, increased noise, and breakage of the ion gauge (vacuum gauge) filament. For this reason, always carry out a vacuum leak check on restarting the instrument after it has been stopped.

A whole range of vacuum leaks can affect the MS, from large leaks that stop the rotary pump from functioning normally to small leaks that are no hindrance to the normal operation of the triple inlet turbo molecular pump. These vacuum leaks develop from very small problems.

There are always O-rings fitted on parts with connections, such as between the lens system door and its housing, as well as the adjacent parts of the orifice. By making close contact with both sides at connections, these O-rings maintain the vacuum inside the housing by preventing vacuum leaks. If dirt adheres to an O-ring, or if you forget to fit an O-ring, a vacuum leak will occur.

When you stop the instrument and carry out maintenance work with the vacuum applied (cleaning of the lens system, replacement of the DL, replacement of the orifice), observe the following points in order to prevent vacuum leaks.

Cautions for preventing vacuum leaks

WARNING



Prohibition

**Do NOT damage the seal faces.
Do NOT forget to fit O-rings.**



Instruction

**Fit O-rings correctly.
Remove any dirt that adheres to O-rings.
Remove dirt on the faces with which the O-ring makes close contact (seal faces).**

In the following circumstances, the rotary pump and triple inlet turbo molecular pump are not operating normally.

- The exhaust noise of the rotary pump continues for several minutes.
- The triple inlet turbo molecular pump started, but after the elapse of around 10 minutes the power to the vacuum system went OFF automatically.

In these cases it is probable that there is a vacuum leak or that the vacuum pump is abnormal. After the vacuum housing has leaked to atmospheric pressure, check the probe holder, lens system door, DL and orifice in accordance with "[Cautions for preventing vacuum leaks](#)" described previously.

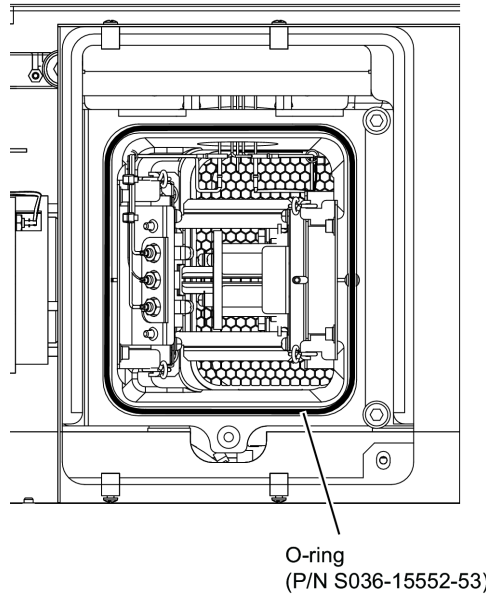
If it is thought that a vacuum leak has occurred for reasons other than those described above, contact your Shimadzu representative.



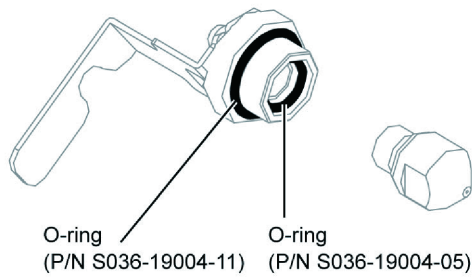
NOTE If the pressure is high, focus your attention on the locations subjected to maintenance.

Parts where there is a possibility of vacuum leakage

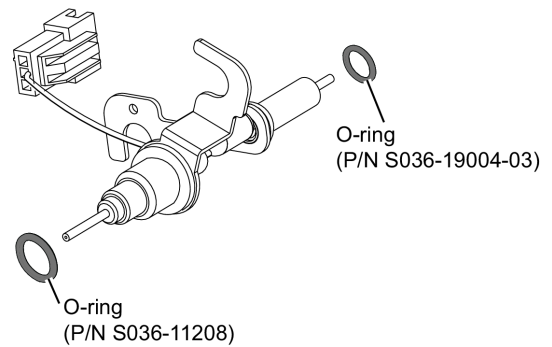
Lens system



Orifice



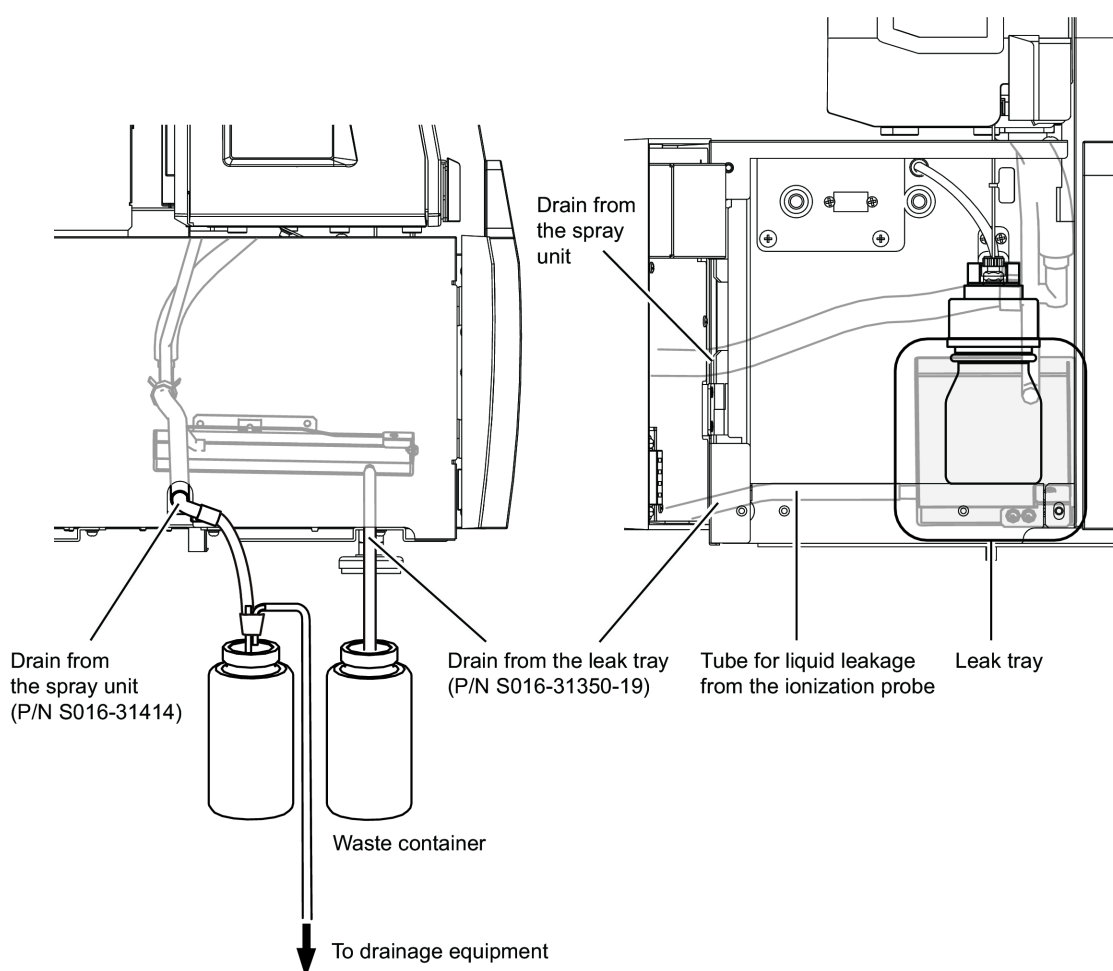
DL



7.13 Replacing the Waste Tubes

Waste tubes are fitted at the locations indicated below.

If these tubes are particularly soiled, or are damaged, replace them.

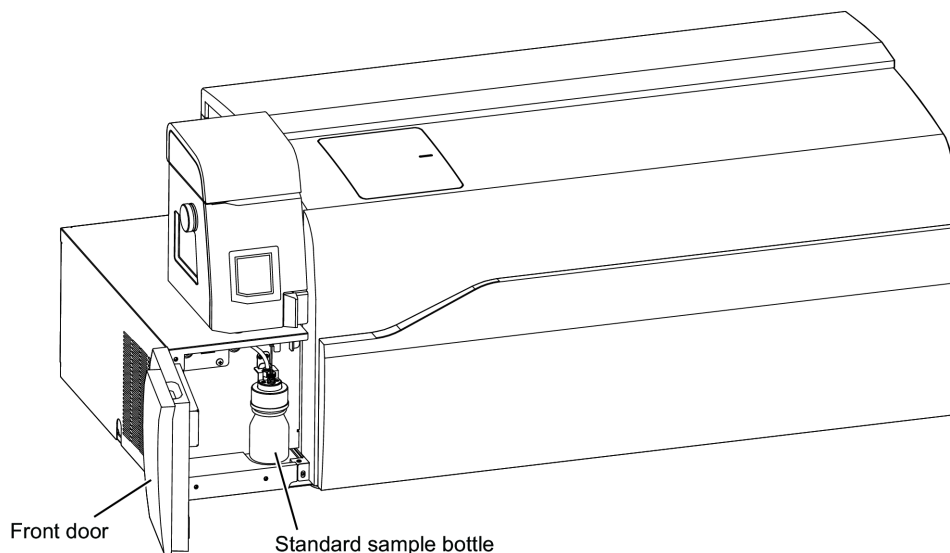


NOTE Replace the waste tubes once every three years.

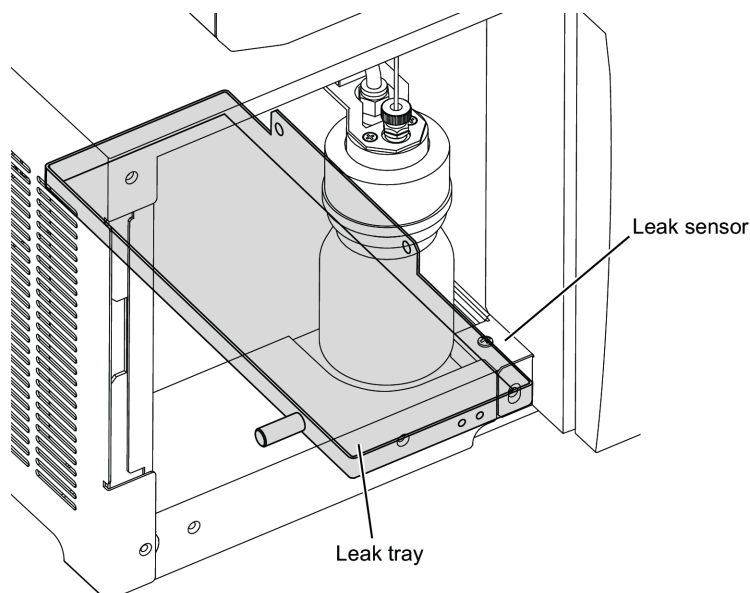
7.14 Cleaning the Leak Tray

The leak tray is fitted with a leak sensor to detect liquid leakage. If a liquid leakage occurs, wipe up all the liquid in the leak tray by following the procedure below.

- 1 Open the front door.



- 2 Completely wipe up all leakage around the leak sensor.
If there is any soiling, wipe it off with water.



7.15 Cleaning the Exterior

If the body cover is soiled, wipe it with a soft dry cloth or tissue paper.

If the soiling is particularly bad, clean it off as follows.

1

Wipe the cover with a cloth that has been dipped in a diluted neutral detergent and wrung out well.

2

Dip a cloth in water, wring it out well and wipe the body so that no detergent remains, then wipe off the moisture with a dry cloth.

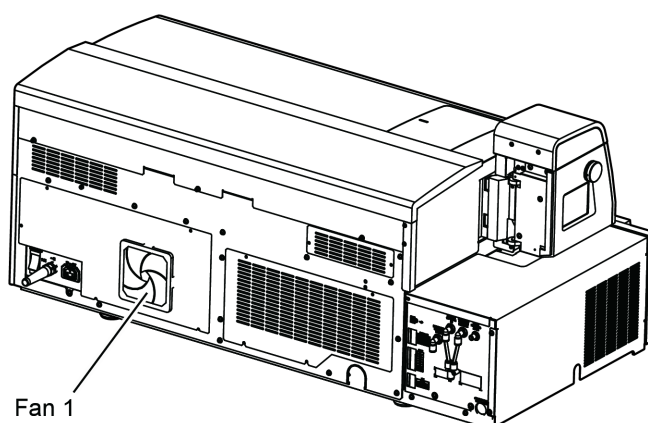
NOTE Do not leave the body moist with water or wipe it over using any kind of alcohol or thinner.
Doing so could cause rust formation or discoloration.

7.15.1 Cleaning the Fans

1

Remove the dust from the two fan filters on the instrument with, for example, a vacuum cleaner.

Clean the fan filters about every six months.



8 Technical Information

8.1 Installation

8.1.1 Conditions for the Installation Site

The instrument will be installed and adjusted by Shimadzu service personnel.

In order to keep the instrument operating stably and to obtain highly reliable analysis results, observe the conditions given below.

■ Power supply

⚠ WARNING



Prohibition

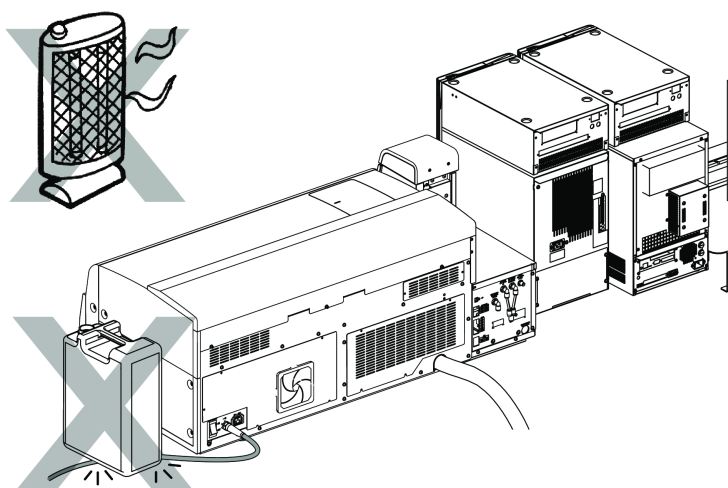
Do NOT share the power supply to this product with any other equipment.
The electric capacity of the instrument must not exceed the stipulated capacity of the earth leakage breaker.

Do NOT rest anything heavy on the power cable.

Do NOT run the power cable close to any heat-generating equipment.

Such treatment could damage the cable, leading to fire, electric shock or instrument failure.

If the cable becomes damaged, contact your Shimadzu representative immediately.



Instruction

Connect the instrument to a compatible power supply.

This product has a power supply voltage of 230 V AC (50/60Hz) at 15 A and power consumption of 3 kVA and 50/60Hz.

Due to the possibility of supply voltage differences, check the instrument name plate and instrument specifications to confirm the suitable power supply for connection. A supply that is not compatible will cause fire or electric shocks.

If the power supply voltage is unstable or the power supply capacity is insufficient, the intended performance of the instrument cannot be guaranteed. The instrument itself may also be damaged. You must check the power supply capacity of the system as a whole and prepare an appropriate supply.

 WARNING

Instruction

The power supply that you connect to must be equipped with an earth leakage breaker.



Instruction

The instrument must be grounded (earthed).

If you do not ground it, there will be a risk of instrument failure and electric shock in the event of current leaks. It is also essential to ground the instrument in order to stabilize it.

["8.1.1 Conditions for the Installation Site" P.198](#)

Required power supply

- | | |
|--|---|
| • LCMS-8050 | Single phase 230 V AC, 15 A (50/60 Hz) |
| Power supply voltage range to guarantee intended performance: | 218.5 to 241.5 V |
| Power supply voltage range to guarantee operation: | 207 to 253 V |
| Frequency stability: | ± 0.5 Hz max. |
| (200 V max.) | 10 A (200 V, 50/60 Hz) |
| (200 V steady) | 4 to 6 A (200 V, 50/60 Hz) |
| (230 V max.) | 10 A (230 V, 50/60 Hz) |
| (230 V steady) | 4 to 5 A (230 V, 50/60 Hz) |
| Short-circuit rating (short-circuit breaking rating) | 300 A |
| • LC | Refer to the specifications or the instruction manual provided with your LC. |
| (The electric capacity varies depending on the configuration of the LC system.) | |
| Prepare the power supply for the LC in accordance with the specifications of the LC unit you are using or the instruction manual. | |
| For details on the power supply specifications of peripheral devices such as the computer and printer, check the specifications or instruction manuals of the units you are using. Approximate values are indicated below. | |
| • Power for PC system | Supply correct voltage to the PC or printer, etc. referring to the instruction manuals accompanying the PC or printer, etc. |

⚠ CAUTION



Instruction

Use a PC, printer, etc. that conform to your local laws and regulations.

Grounding

100 $\Omega_{\text{max.}}$

In order to prevent electric shocks, be sure to ground the instrument (connect it to earth).

Installation conditions

- Overvoltage category: Category II (IEC)
- Pollution degree: 2 (IEC)
- Installation conditions: In accordance with IEC standards, this instrument is rated for installation category II, pollution degree 2, operating altitude up to 2000 m, and indoor use.

■ Installation environment

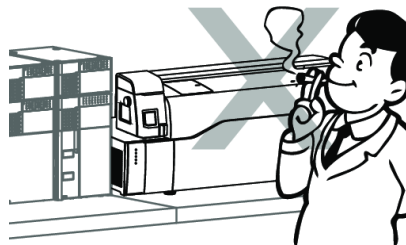
⚠ WARNING



Prohibition

Do NOT use naked flames.

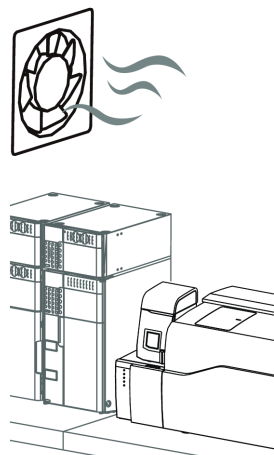
The use of naked flames is prohibited at the site where the high performance liquid chromatograph mass spectrometer is installed. You should also avoid installing other equipment that produces a naked flame in the same room. To ensure readiness in the event of an accident, install a fire extinguisher.



Instruction

Be sure to provide ventilation in the room.

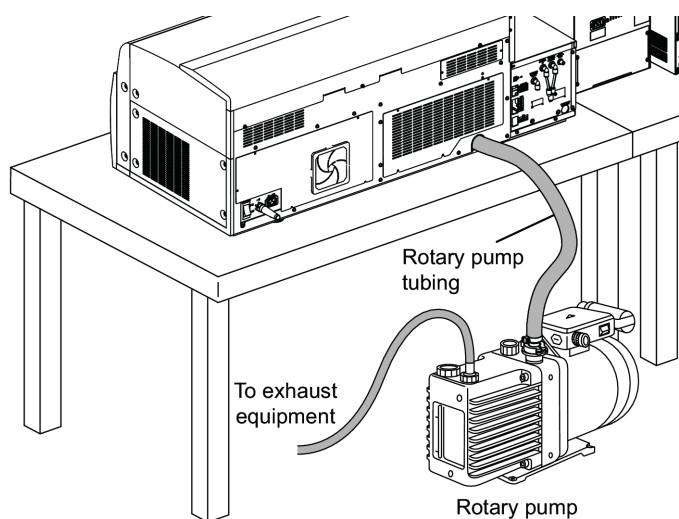
Some of the solvents that are used with a high performance liquid chromatograph mass spectrometer are inflammable or toxic. Also note that this instrument contains a large quantity of nitrogen gas. Its use in a room that is inadequately ventilated could cause oxygen deficiency. Install the instrument in a room that has a ventilation mechanism such as the type of draft chamber in general use (approx. 20 m³/min), and feed the exhaust tube into the draft chamber.



Instruction

Use a duct system for exhaust.

Be sure to release the exhaust gas from the rotary pump, the solvent vapor that builds up in the waste container, and nitrogen gas into a duct system such as a draft chamber. Be sure to provide separate exhaust channels for the exhaust from the rotary pump and the nitrogen for ionization. Failure to do so will lead to contamination of the mass spectrometer.



! WARNING

Instruction

Keep the ventilation system turned on throughout the night.

Turning off the ventilation system may cause accumulation of the exhaust gas.



Instruction

Install water supply equipment, such as a wash basin.

If a solvent gets into someone's eyes or someone touches a toxic solvent, it has to be rinsed away immediately. Install water supply equipment, such as a wash basin, as close to this product as possible.

! CAUTION

Prohibition

Do NOT install this product in a location where there is corrosive gas, contaminants or a lot of dust.

Avoid installing the instrument at a location where there is corrosive gas or a lot of dust in order to maintain its performance.



Prohibition

Do NOT install the instrument close to any device that generates a strong magnetic field.

To ensure that the instrument can be operated normally, do not install it at a location where there is a strong magnetic field.

In addition, if there is a lot of noise in the power line add a noise filter.



Instruction

Observe the installation conditions.

- A room with a temperature within the range 18 to 28 °C and where the change in room temperature throughout the day is small
Note that temperature changes over a short time can cause instability in the instrument. In order to ensure that stable analysis is performed, make sure that changes in temperature over a short period of time do not exceed 3 °C.
- A location where the instrument is not directly exposed to the airflow from a heater/air conditioner
- A location not exposed to direct sunlight
- A location where there is little vibration
- A location where the humidity remains within the range 20 to 70 % (no dew condensation or electrostatic discharge)
- A location free from corrosive gas, contaminants and dust

■ Installation space

! CAUTION

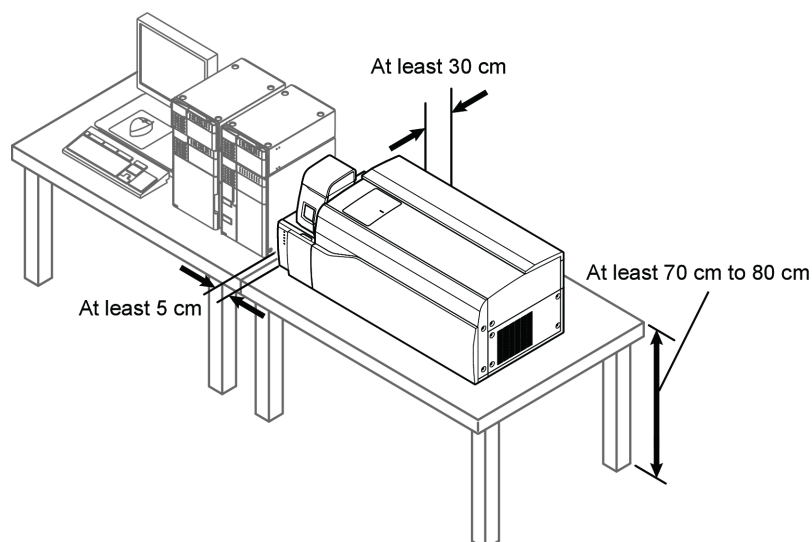


Instruction

Install the product on a desk or table that meets the following requirements.

- **Flat and stable**
Able to comfortably bear the weight of this product (approx. 140 kg) and the entire computer system.
Having a depth of at least 75 cm.
Failing to meet these requirements can cause accidents in which the table collapses or units fall off.
- **Allowing the instrument to be placed a sufficient distance from walls**
Make the distance between the rear face of the instrument and the wall at least 30 cm and the distance between the left and right faces and other units at least 5 cm. If these conditions are not met it will not be possible for the fans to provide adequate air cooling and there will be a risk that the instrument will overheat and its performance will drop.
- **Providing sufficient space for maintenance**
For maintenance purposes a space of at least 30 cm is required to the right of the body of the instrument. Place units that are easy to move, like the computer and printer, on the right side of the instrument body, and place walls and units that are difficult to move at a distance of at least 30 cm from the instrument body.
- **Having an appropriate height**
Use a table with a height of about 70 to 80 cm. Using a table with a height outside this range will impair the operating convenience of the instrument, so care is required.

▶▶ Reference "9.5 Example Installation" P.242

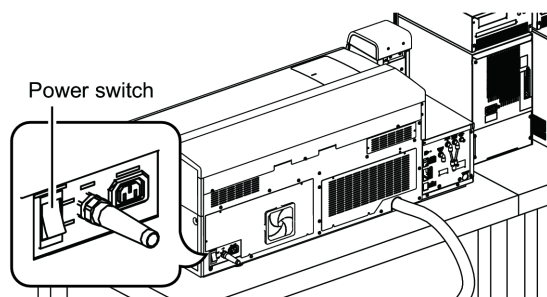


! CAUTION

Instruction

Install the instrument so that the power switch can be operated easily.

If the power switch is difficult to operate, it will not be possible to switch the power off immediately in an emergency.



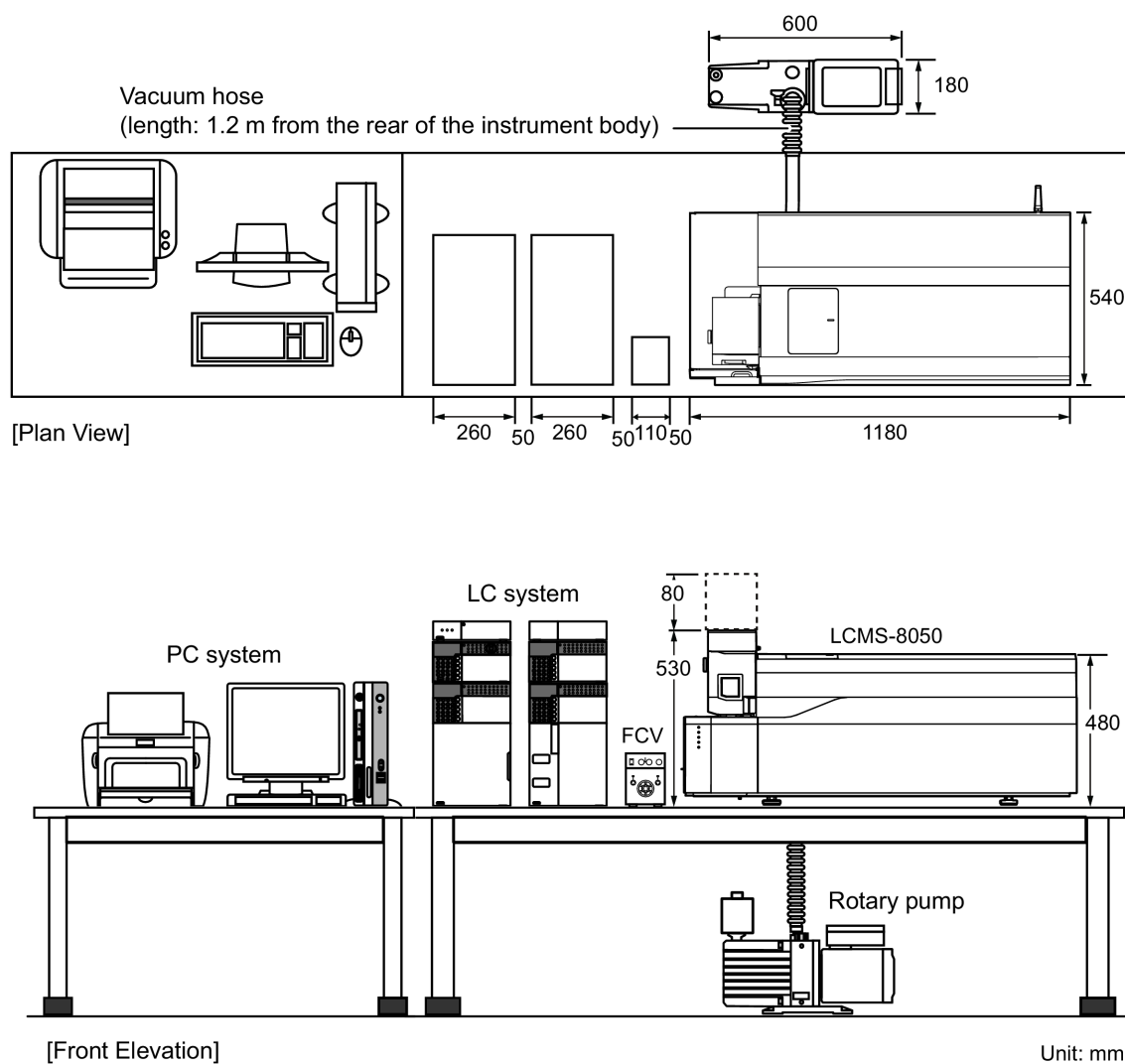
Instruction

Install the rotary pump on a stable floor.

Install the body of the instrument and the rotary pump at a distance that allows them to be connected with the tubing.

If the tubing is extended the intended performance of the machine cannot be guaranteed.

An example configuration of a typical system and its installation space are shown in the figure below.



8.1.2 Connecting the Instrument

■ Connecting the rotary pump

! WARNING



Instruction

Be sure to use the rotary pump specified by Shimadzu.

Use the rotary pump specified by Shimadzu. Using a different pump may impair the intended performance of the instrument. It may also cause an accident.

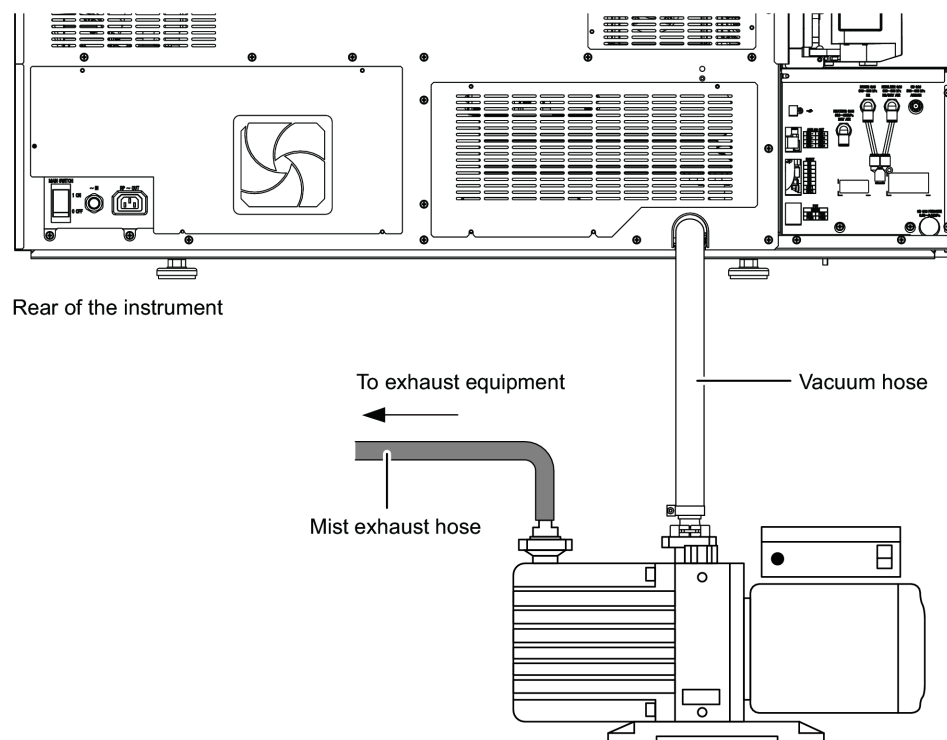
1

Connect the vacuum hose of the rotary pump.

2

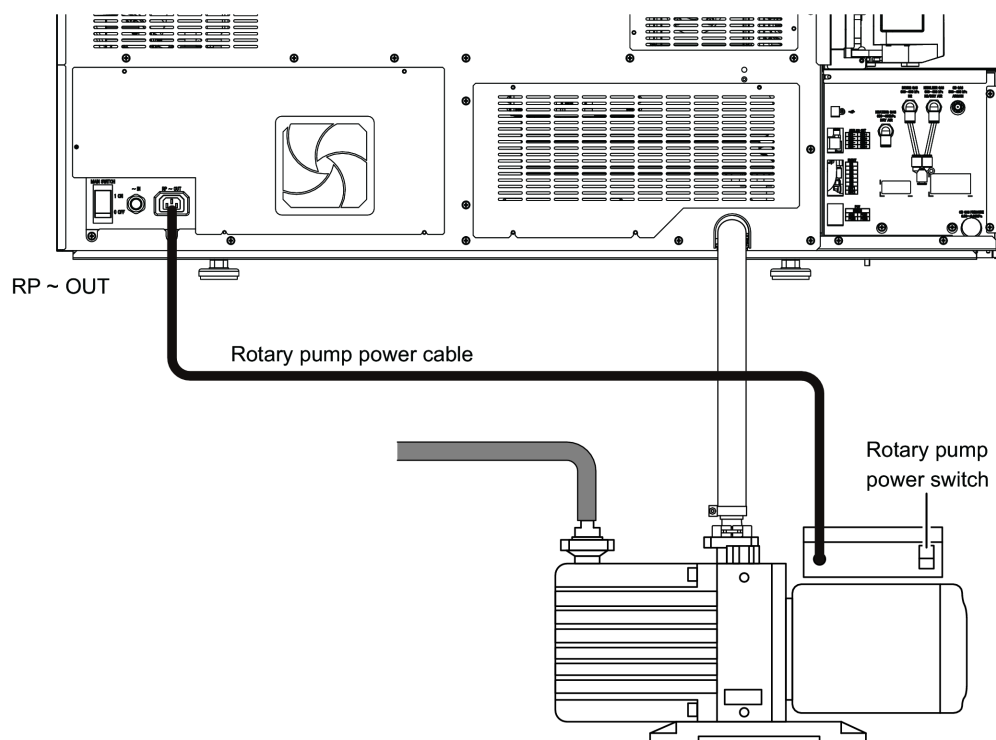
Connect the rotary pump mist exhaust hose.

Connect the other end of the hose to the exhaust system.



3

Connect the rotary pump's power cable to the instrument.

4**Turn the rotary pump's power switch ON.**

■ Fitting the oil mist filter and oil return tube

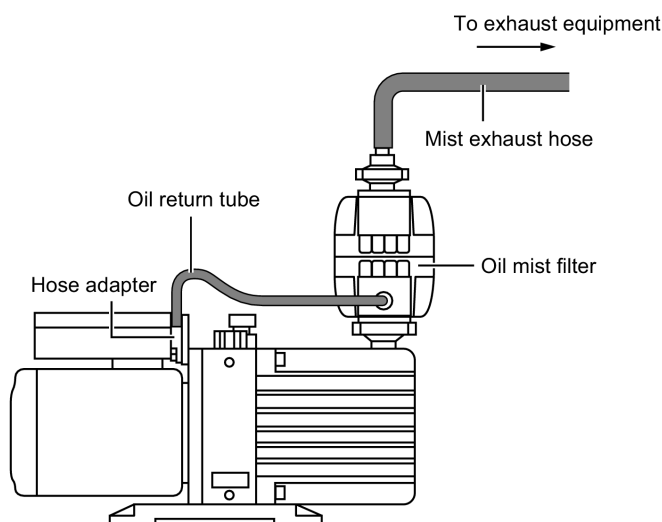
The oil mist filter is a part that traps the exhaust mist from the rotary pump.

The oil return tube serves to return the oil that accumulates in the oil mist filter.

In cases where the quantity of mobile phase introduced for mass spectrometer is 0.5 mL/min or greater, a large quantity of water is introduced into the rotary pump and for this reason the gas ballast valve has to be opened and closed frequently in order to remove this water. In cases like this you are recommended to use the oil return kit.

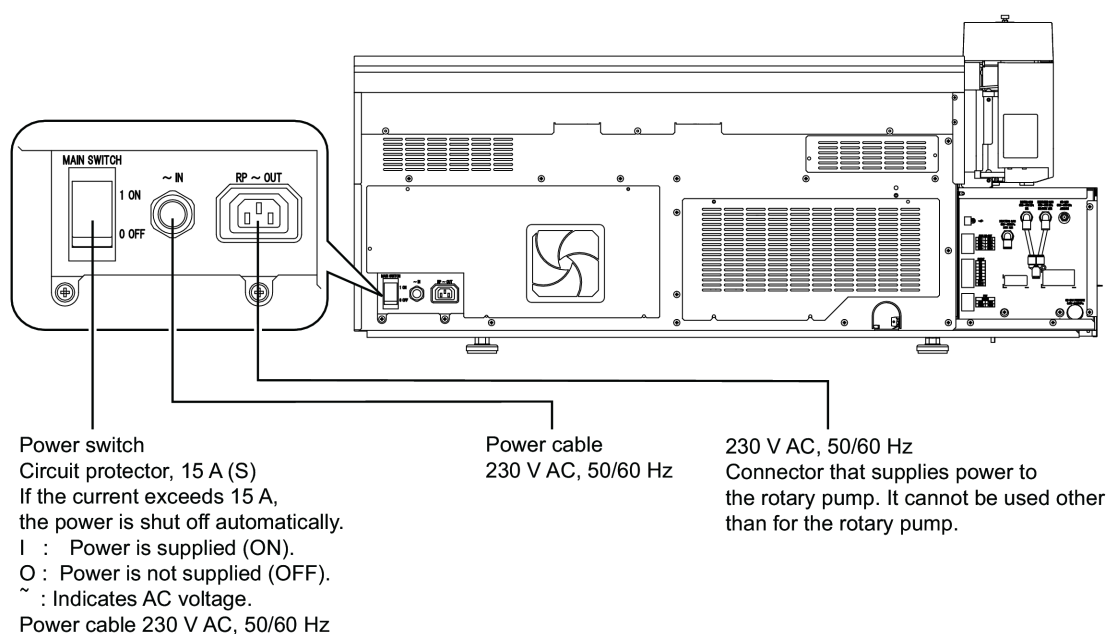
The rotary pump oil return kit is included in the optional parts and should be purchased if required.

Part Name	Part No.
Rotary pump oil return kit	S225-05990-92



■ Connecting the power supply cable

- 1 Connect the instrument's power cable to a power supply that is fitted with an earth leakage breaker.
- 2 Turn the instrument's power switch ON.

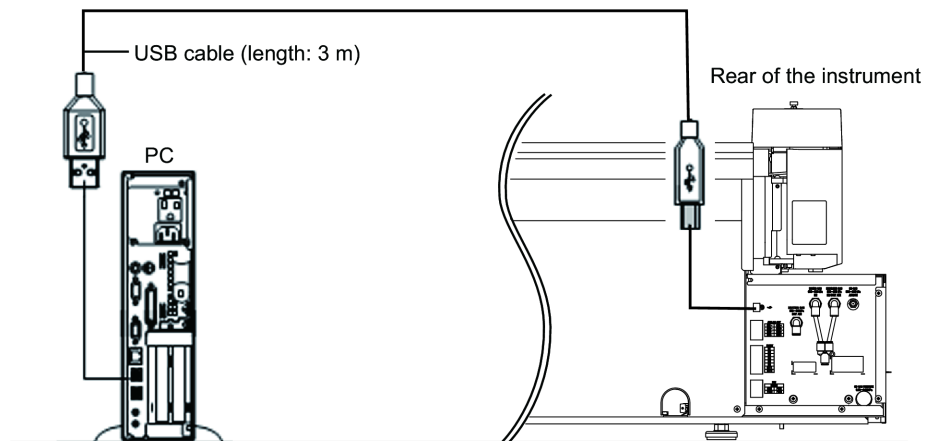


■ Connection to the PC

The LCMS-8050 and computer are connected with a USB cable.

1

Connect the USB socket on the rear face of the LCMS-8050 and a USB socket on the computer.

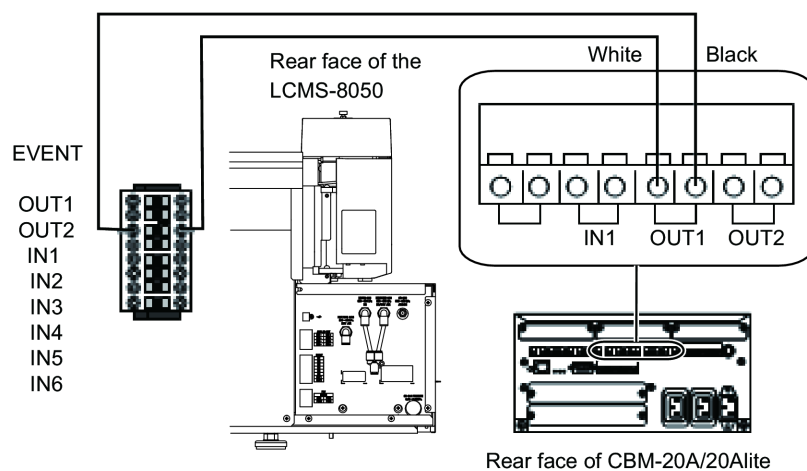


■ Connecting to the LC

When connecting to the CBM-20A or CBM-20Alite system controller:

1

Connect the start cable between the EVENT IN1 terminal on the rear face of the LCMS-8050 and the OUT1 or OUT2 terminal on the rear face of the CBM-20A/20Alite.



8.1.3 About the Gas Used

This instrument uses a large volume of nitrogen gas. This poses a risk of anoxia symptoms (oxygen deficiency). Read this section carefully and give adequate consideration to the use of nitrogen gas.

■ Preventing anoxia symptoms (oxygen deficiency)

In accordance with the regulations for preventing anoxia symptoms, provide ventilation to maintain the concentration of oxygen at least 18 % at the installation site. (The normal concentration of oxygen in the air is about 21 %).

Install the instrument in a room that has a ventilation mechanism such as the type of draft chamber in general use (approx. 20 m³/min), and feed the exhaust tube into the draft chamber.

When using nitrogen gas, appoint a person in charge of operations where there is a danger of anoxia (a person who has completed a skills course for a first class superintendent of work involving a danger of anoxia) and give the workers special training relating to anoxia hazards.

To cover all eventualities, you are also recommended to use a separate oxygen analyzer. Details of the recommended portable oxygen analyzer are given below.

Recommended product: Type XO-2000 oxygen analyzer

- New Cosmos Electric Co., Ltd.
2-5-4 Mitsuyanaka, Yodogawa-ku, Osaka 532-0036, Japan
TEL: +81-6-6308-311
FAX: +81-6-6308-8129
URL: <http://www.new-cosmos.co.jp/en/index.html>

■ Specifications of the nitrogen gas

In order to maintain the performance of the instrument, use gas with the specifications indicated below.

- Supply pressure: 690 to 800 kPa
- Purity: 99.5 % or greater,
(For nitrogen gas generators: 97 % or greater)
- Max. flow rate during use: 23.0 L/min (ESI/DUIS), 24.4 L/min (APCI)

You are recommended to use a nitrogen gas generator.

■ Specifications of argon gas

Argon gas is used for the CID gas. Use gas with the specifications indicated below.

- Supply pressure: 500 kPa to 800 kPa
- Purity: 99.99 % or greater

■ Specifications of dry air

In order to maintain the performance of the instrument, use gas with the specifications indicated below.

- Supply pressure: 690 to 800 kPa
- Purity: Water-free, Oil-free
- Max. flow rate during use: 20.0 L/min

You are recommended to use a dry air generator and a hydrocarbon trap.

CAUTION



Instruction

Cautions on the use of high-pressure gas cylinders

If you use a high-pressure gas cylinder as the gas supply source, follow the guidance of the cylinder dealership and others and handle the cylinders in a way that will avoid accidents.

- High-pressure gas cylinders should be sited outdoors at a location where there is a good passage of air and no exposure to direct sunlight, and the gas should be fed indoors through tubing. In the case of liquefied gases in particular, these arrangements are obligatory under law.
- Take care to ensure that high-pressure gas cylinders never reach high temperatures of over 40 °C. Also ensure that there will be no naked flames within 2 m of the cylinders.
- Pay adequate attention to ventilation, and, as a start-of-work inspection, check for gas leakage using, for example, the soapy water test.
- Secure high-pressure gas cylinders, e.g. with rope, so that they cannot be made to fall over/fall off.
- Make sure that you use a pressure reducing valve of the oil prohibition type. In addition, do not use a valve that has oil adhering to the inside faces of the pipes that gas comes into contact with.
- When the use of gas has finished, turn off the main cock on the high-pressure gas cylinder immediately.
- Inspect the pressure gauge to check that it functions correctly at least once every three months.
- Note that permission is required under the law to store more than 300 m³ (standard status) of high-pressure gases like these.



Instruction

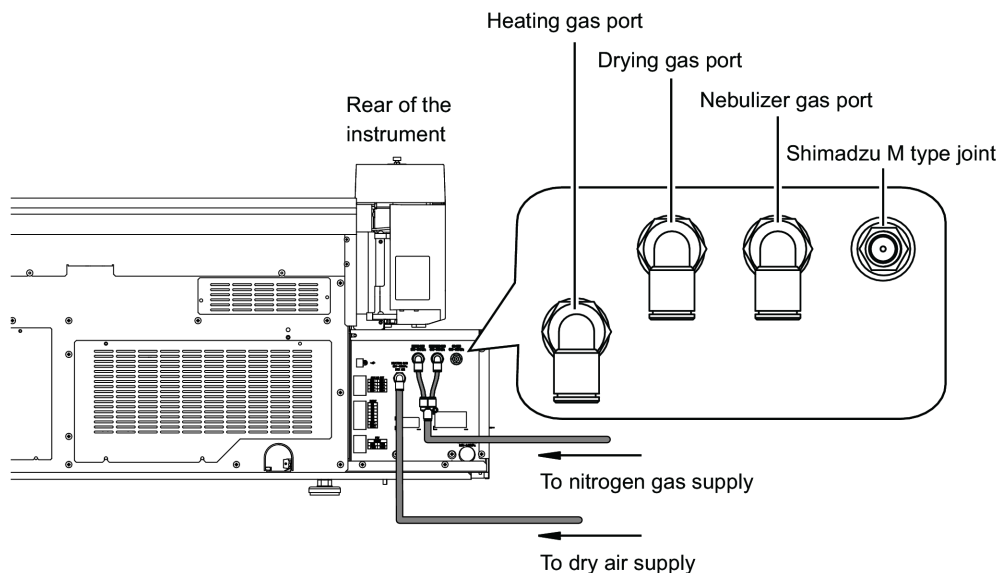
Handle high-pressure gas cylinders correctly in compliance with regulations, the general high pressure gas preservation regulations and laws applicable in your country.

■ Supplying nebulizer gas and drying gas

1

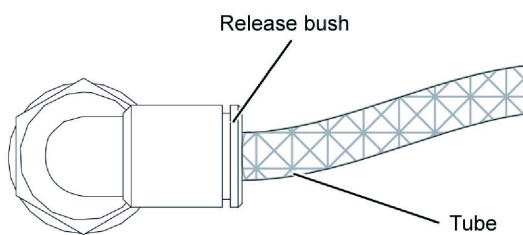
Connect the nitrogen gas tubing to the rear of the instrument.

In the standard specifications, a $\phi 6$ mm tube joint is fitted. If, for example, you are connecting inch size tubing, prepare a convertor joint.



Connection to and disconnection from the one-touch joint for gas

- NOTE**
- To connect, insert the tube as far as it will go into the joint.
 - To disconnect, press in the release bush.



2

Open the main cock for the supply of nebulizer gas and drying gas.

Check that the supply pressure is 690 to 800 kPa.

■ Supplying CID gas

1**Connect the argon gas tubing to the rear of the instrument.**

A Shimadzu M-shaped joint (see step 1 of "[Supplying nebulizer gas and drying gas](#)") is attached to the rear of the instrument.

The following gas conductor has been prepared for connecting the argon gas cylinder to the LCMS-8050.

Part Name	Part No.
Gas conductor (length: 2.5 m)	S201-48067

2**Open the argon gas main cock in order to supply CID gas.**

Check that the supply pressure is 500 to 800 kPa.

■ Supplying heating gas

1**Connect the dry air tubing to the rear of the instrument.****2****Open the dry air main cock in order to supply heating gas.**

Check that the supply pressure is 690 to 800 kPa.

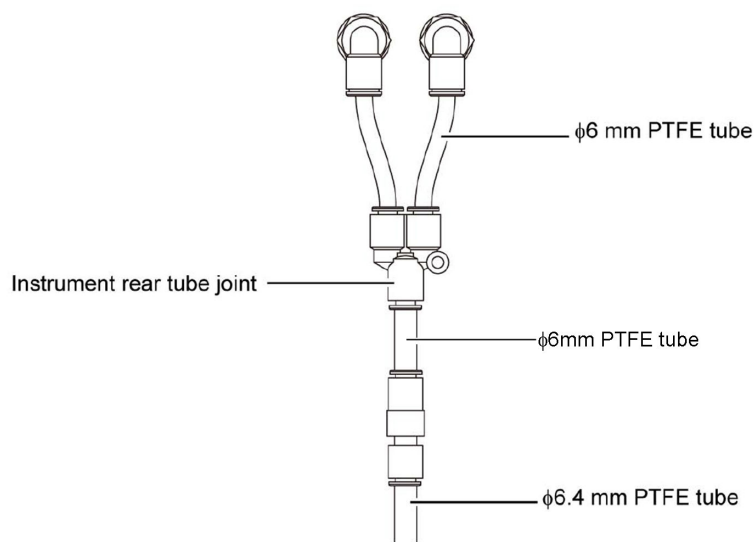
About tubing joints

The parts described below are options. Purchase them if necessary.

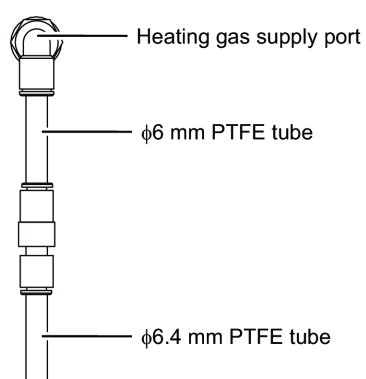
■ Conversion from inch sizes

Part Name	Part No.
Tube joint 6.4	S225-15849-91

For supplying nebulizer gas and drying gas

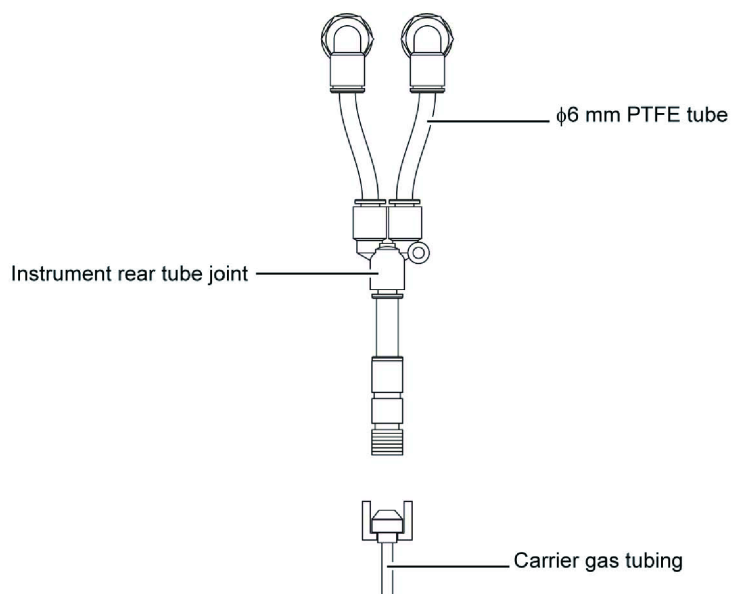


For supplying heating gas



■ Carrier gas tubing: Conversion from a Shimadzu M type joint

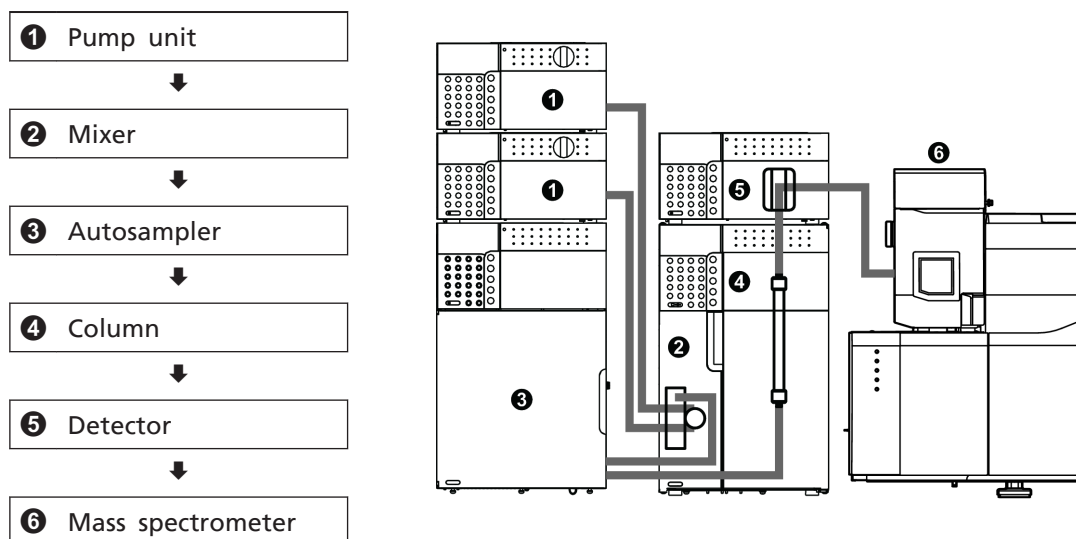
Part Name	Part No.
Gas pipe adapter kit	S225-10766-91



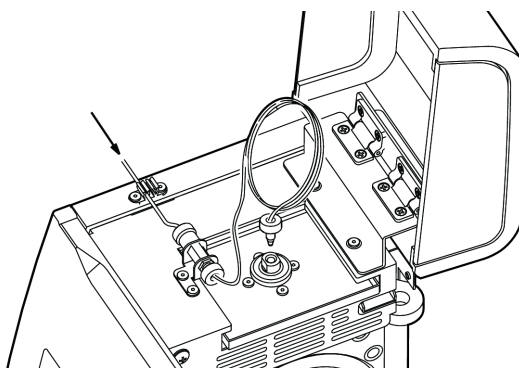
8.1.4 Tubing for the LC Flow Line

■ Piping example

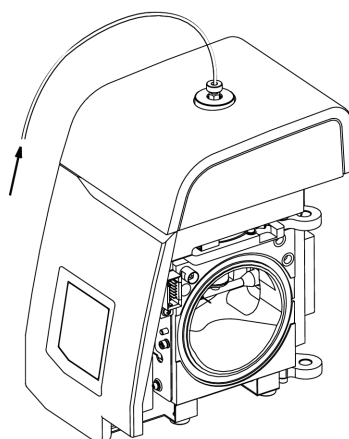
A typical example of the tubing used with the LCMS-8050 is shown below.



■ For ESI (DUIS)



■ For APCI



8.1.5 Installing the Standard Sample

The standard sample is used for optimization of the supply pressure to the lens system and quadrupole rods inside the instrument in auto tuning, for sensitivity adjustment, for resolution adjustment, and for mass calibration.

! CAUTION



Instruction

Turn the standard sample OFF from LabSolutions before removing tubing or the bottle cap.

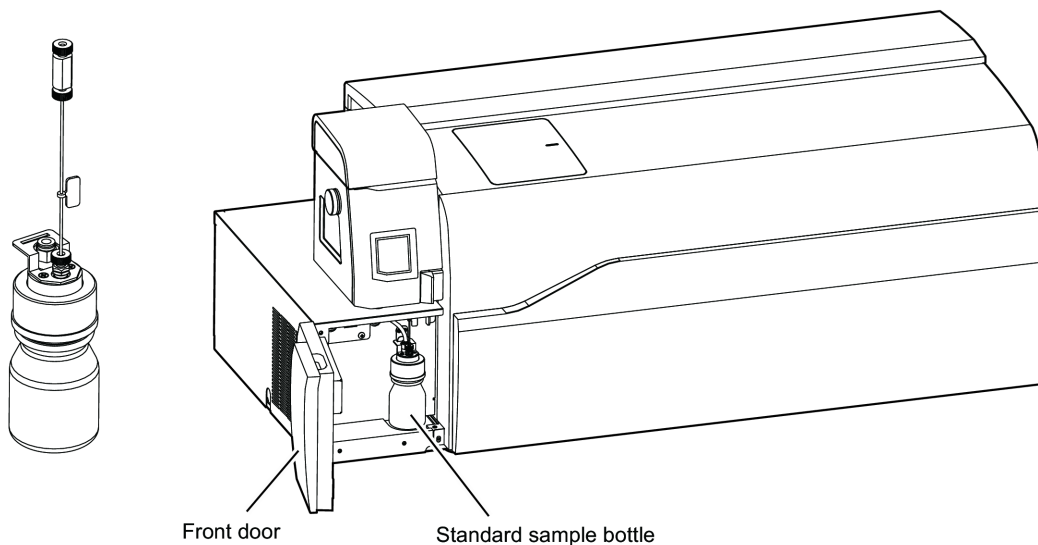
1

Pour 40 to 80 mL of standard sample into the standard sample bottle.

▶▶ Reference "7.6.1 Replacing the Standard Sample" P.162

2

Open the front door and set the standard sample bottle in the instrument.



NOTE

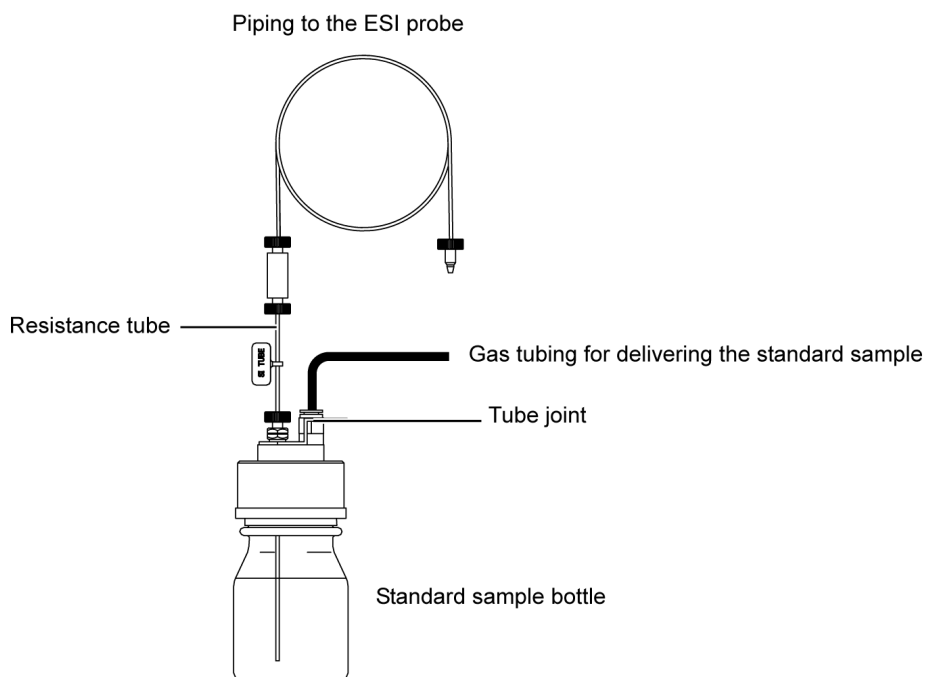
A glass capillary tube is inserted into the resistance tube. Do not cut the tube. If bent abruptly, it could break. Maintain a moderate bending radius of at least 40 mm while handling the tube.

3

Connect the gas tubing for delivering the standard sample.

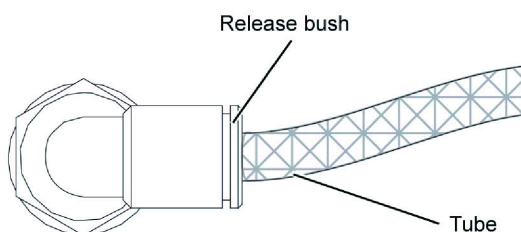
4

Connect the resistor tube and the tubing to the ionization probe.



Connection to and disconnection from the one-touch joint for gas

- NOTE**
- To connect, insert the tube as far as it will go into the joint.
 - To disconnect, press in the release bush.



►► **Reference** For a figure showing how to run the tube to the instrument body, see step 2 of "[3.8.1 Preparing the Standard Sample](#)".

8.1.6 Installing the Waste Container

WARNING



Instruction

For details on handling the waste container, be sure to read "[Static Electricity Precautions](#)" P.xiii.

CAUTION



Instruction

Install the waste container at a position lower than the surface on which the LCMS-8050 is installed.

The waste liquid is expelled through the mechanism of a head drop. This will cause the waste liquid to overflow into the interior of the instrument.



Instruction

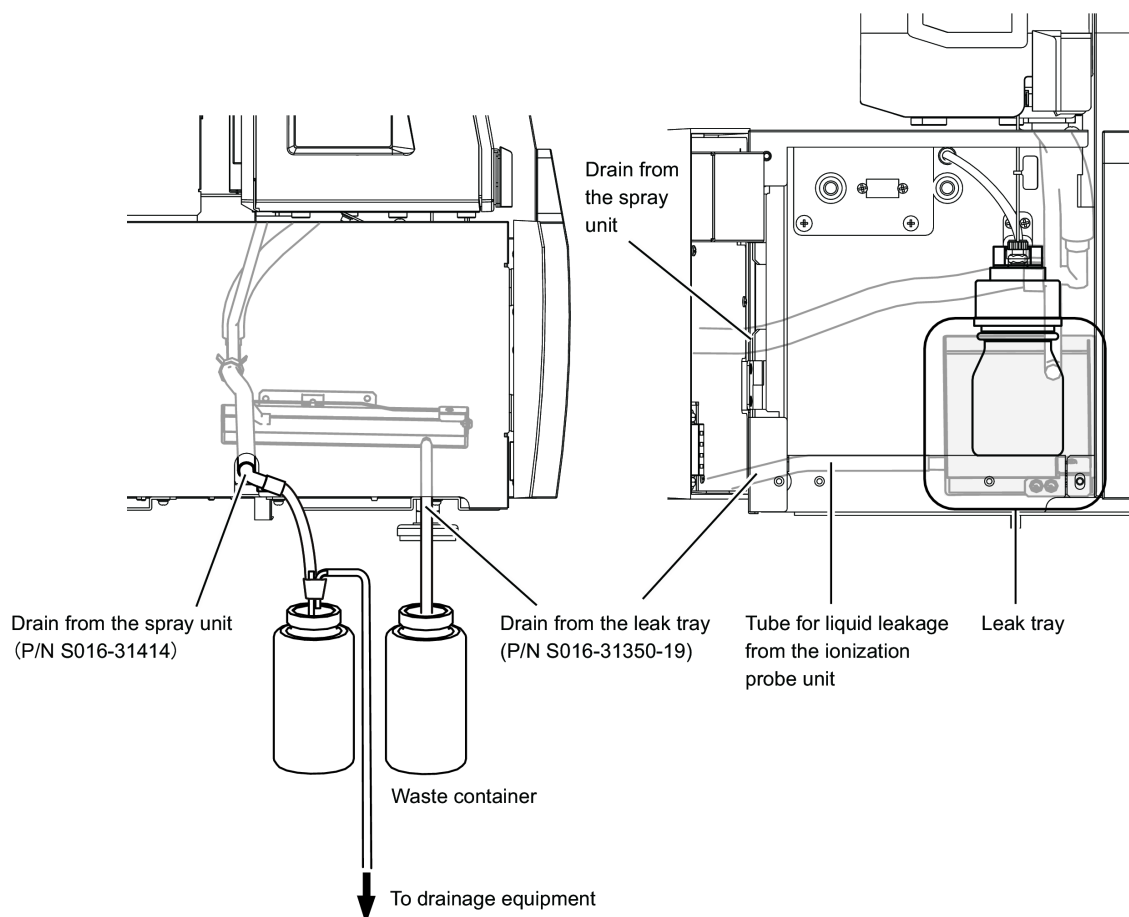
Make sure that the waste tube is not submerged below the surface of the liquid.

This will cause the waste liquid to overflow into the interior of the instrument.

1

Prepare a waste container of an appropriate capacity (diameter of mouth: 29 to 31 mm) and place this container at a position lower than the instrument (e.g. on the floor).

Connect the drain in the manner shown in the figure below.



8.2 Manual Tuning

In manual tuning, the instrument can be adjusted manually while monitoring peaks. If peaks cannot be checked while using manual tuning, execute auto tuning instead.

- NOTE**
- Ion monitoring using the standard sample can be accomplished in ESI analysis.
 - If the APCI unit has already been installed, remove it and install the ESI unit.
 - Remove the needle unit before performing manual tuning in the DUIS mode.

CAUTION



Instruction

Create a new tuning file when replacing the detector and never use a previous tuning file.

8.2.1 Checking Ions in the [MS Tuning] Window

1

Connect the standard sample.

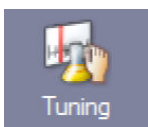
▶▶ Reference "8.1.5 Installing the Standard Sample" P.218

2

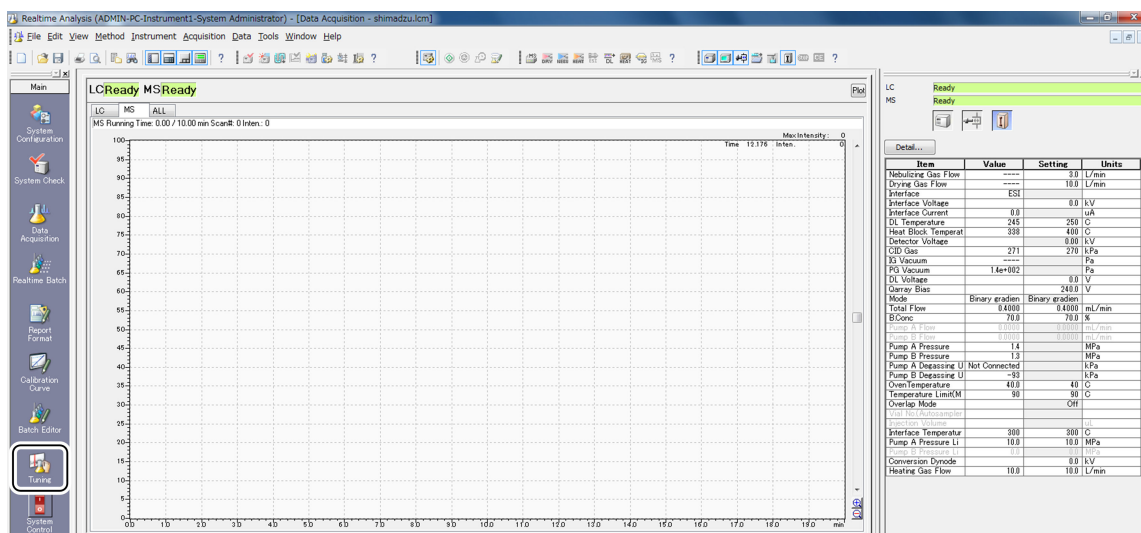
Start up LabSolutions.

▶▶ Reference "3.1.2 Starting the Vacuum System" P.45

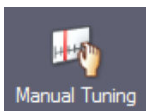
3

Click the  (Tuning) icon.

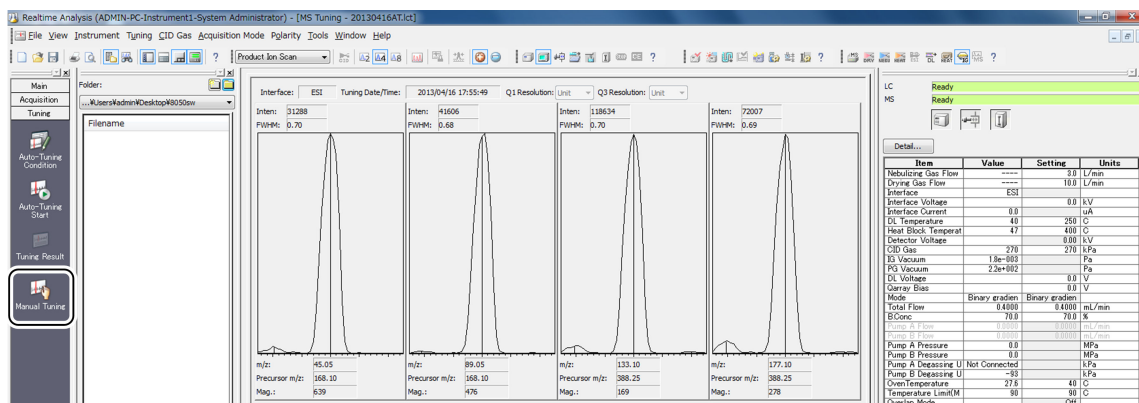
The [Tuning] window is displayed.



4

Click the  (Manual Tuning) icon.

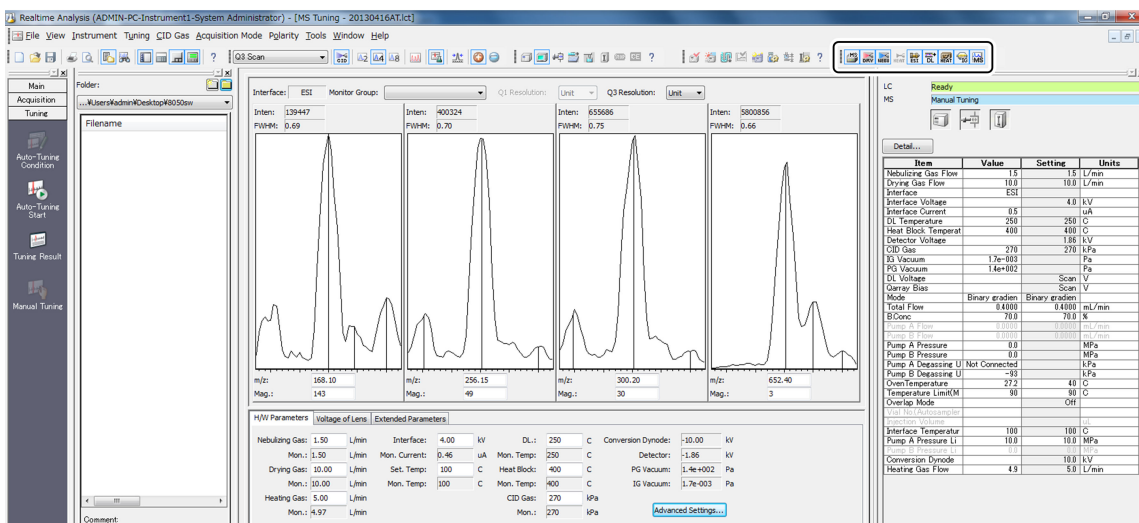
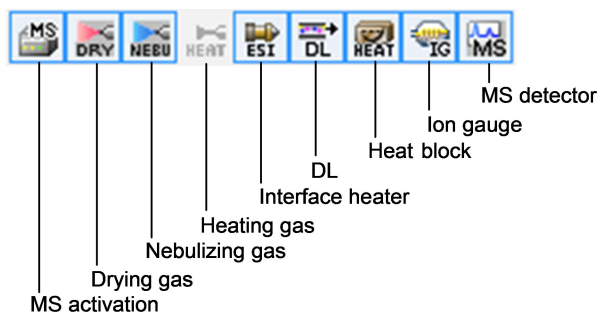
The [MS Tuning] window is displayed.



5

Turn ON the nebulizer gas, heating gas, the heaters (DL, heat block, interface heater) and the [MS detector] button.

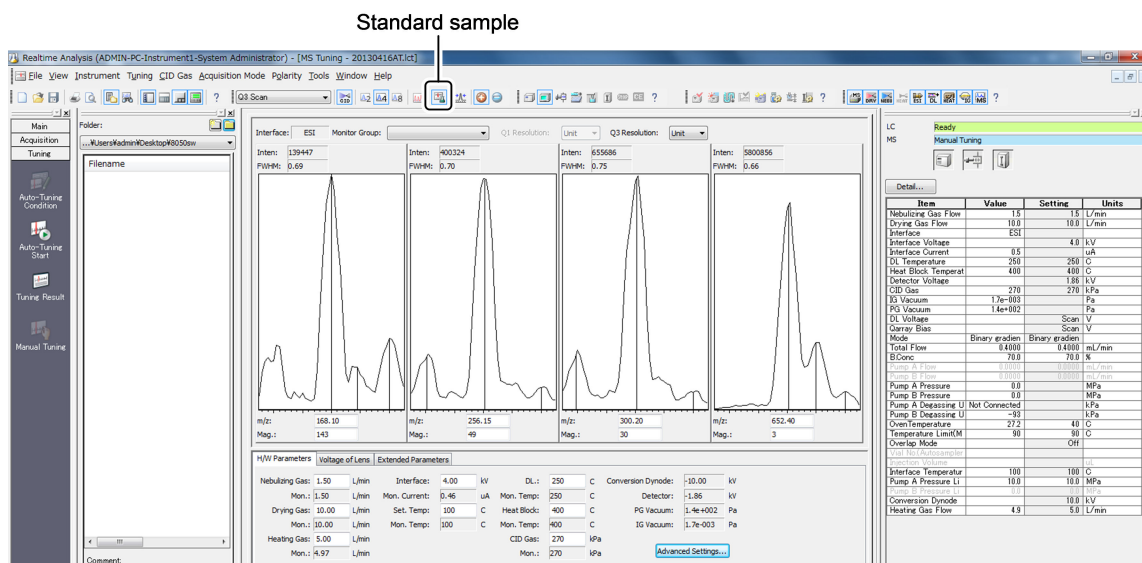
 **Hint** When turning ON both the heating gas and the interface heater, the heating gas icon will be displayed in gray.



8

6

Turn ON the  (standard sample) button.



The sample will not flow out for approximately one minute while the sample tubing becomes filled with the sample.

7

Check the peaks in the [MS Tuning] window.

In manual tuning, screen settings are configured so that the following ions can be monitored in each analysis mode.

- Ions configured in positive mode

Analysis Modes	Peak Monitor Settings m/z
Q1 and Q3 scan	168.10, 256.15, 344.20, 652.40, 1004.60, 1224.75, 1603.15, 1893.40
Precursor ion scan	168.10 < 89.00, 300.20 < 89.00, 344.20 < 177.10, 388.25 < 177.10
Product ion scan	168.10 < 45.05, 168.10 < 89.00, 388.25 < 133.10, 388.25 < 177.10
Neutral loss scan	256.15, 300.20, 344.20, 388.25, neutral loss 211.15

- Ions configured in negative mode

Analysis Modes	Peak Monitor Settings m/z
Q1 and Q3 scan	503.15, 1007.30
Precursor ion scan	503.15 < 89.00, 1007.30 < 503.15
Product ion scan	503.15 < 89.00, 503.15 < 179.05
Neutral loss scan	503.15 neutral loss 414.15, 503.15 neutral loss 324.10

►► Reference "8.3.3 Mass of the Standard Sample" P.235

Switching the number of windows displayed

Switch to 8 windows
Switch to 4 windows
Switch to 2 windows

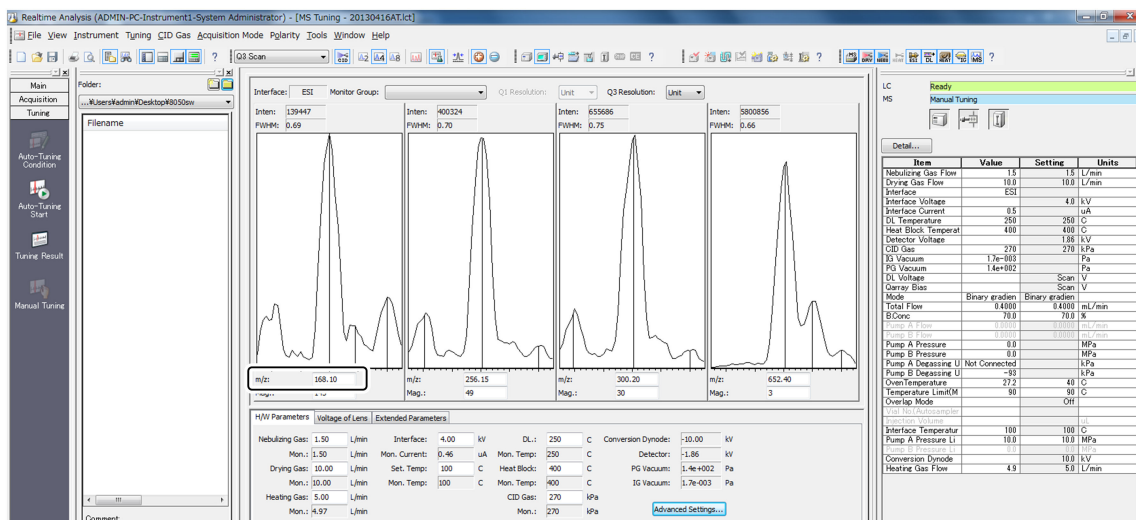
Item	Value	Setting	Units
Nebulizing Gas Flow	1.5	1.5	L/min
Drying Gas Flow	10.0	10.0	L/min
Interface Voltage	ES1	4.0	kV
Interface Current	0.5		uA
DL Temperature	250	250	°C
Heat Block Temperature	400	400	°C
Detector Voltage	1.86	1.86	kV
CID Gas	270	270	kPa
PG Vacuum	1.7e-003		Pa
PG Vacuum	1.4e-002		Pa
DL Voltage	Scan V		
Quarry Bias	Scan V		
Mode	Binary gradient	Binary gradient	
Total Flow	8.4888	8.4888	mL/min
B: Conc.	70.0	70.0	%
Sump A Flow	0.0000	0.0000	mL/min
Sump B Flow	0.0000	0.0000	mL/min
Pump A Pressure	0.0		MPa
Pump B Pressure	0.0		MPa
Pump A Depressure U	Not Connected		kPa
Pump B Depressure U	-93		kPa
Oven Temperature	27.2	40	°C
Temperature Limit(M)	90	90	°C
Overlap Mode		Off	
Interface Temperature	180	180	°C
Pump A Pressure LI	10.0	10.0	MPa
Pump B Pressure LI	0.0		MPa
Conversion Dynode	10.0	10.0	kV
Heating Gas Flow	4.0	5.0	L/min

Switching between the positive ion and negative ion monitor

- Monitor negative ions
+ Monitor positive ions

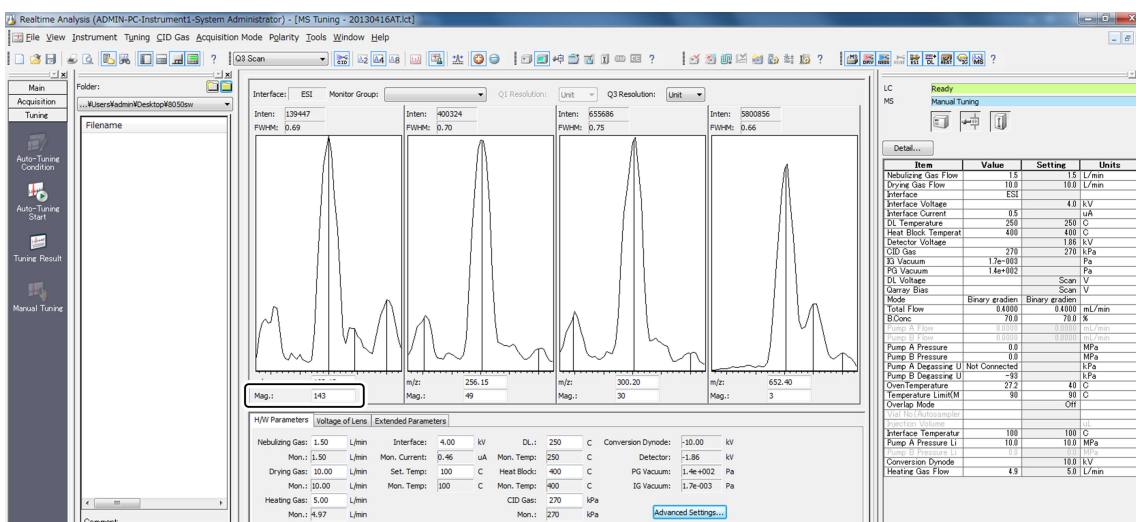
Item	Value	Setting	Units
Nebulizing Gas Flow	1.5	1.5	L/min
Drying Gas Flow	10.0	10.0	L/min
Interface Voltage	ES1	4.0	kV
Interface Current	0.5		uA
DL Temperature	250	250	°C
Heat Block Temperature	400	400	°C
Detector Voltage	1.86	1.86	kV
CID Gas	270	270	kPa
PG Vacuum	1.7e-003		Pa
PG Vacuum	1.4e-002		Pa
DL Voltage	Scan V		
Quarry Bias	Scan V		
Mode	Binary gradient	Binary gradient	
Total Flow	8.4888	8.4888	mL/min
B: Conc.	70.0	70.0	%
Sump A Flow	0.0000	0.0000	mL/min
Sump B Flow	0.0000	0.0000	mL/min
Pump A Pressure	0.0		MPa
Pump B Pressure	0.0		MPa
Pump A Depressure U	Not Connected		kPa
Pump B Depressure U	-93		kPa
Oven Temperature	27.2	40	°C
Temperature Limit(M)	90	90	°C
Overlap Mode		Off	
Interface Temperature	180	180	°C
Pump A Pressure LI	10.0	10.0	MPa
Pump B Pressure LI	0.0		MPa
Conversion Dynode	10.0	10.0	kV
Heating Gas Flow	4.0	5.0	L/min

■ Entering the m/z value to be monitored



■ To change the monitoring magnification

Enter a value at [Mag.].

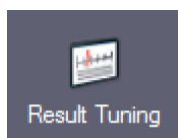


Move the mouse cursor into the ion observation panel and double click to display the data standardized at the maximum intensity.

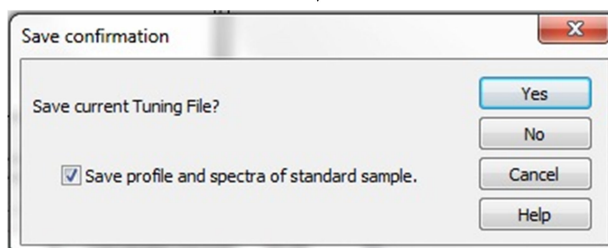
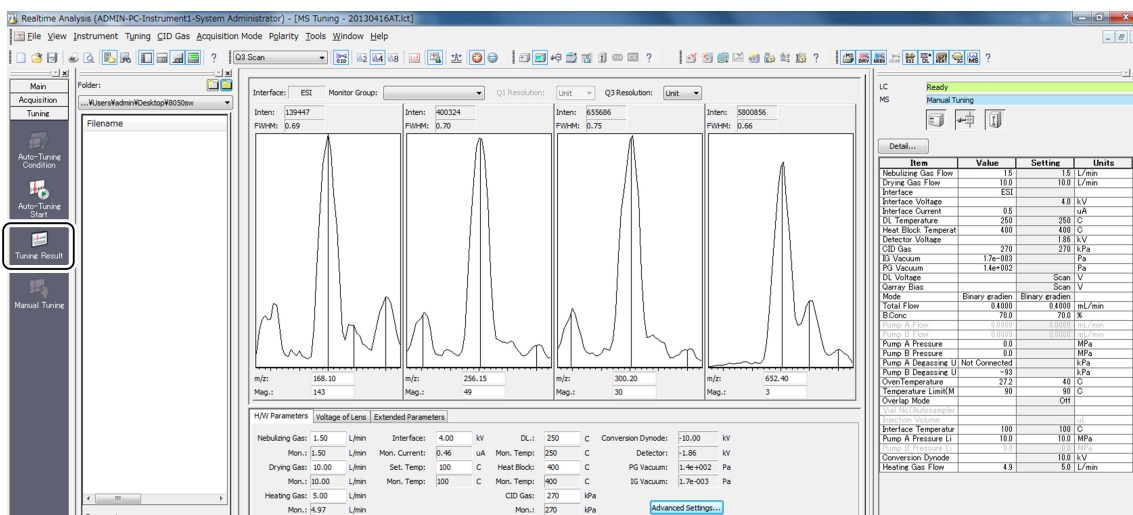
8.2.2 Exiting the [MS Tuning] Window

1

Click the



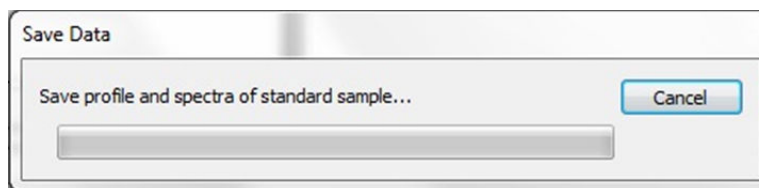
(Result Tuning) icon to exit manual tuning.



The save confirmation message is displayed. Click [Yes] to save the result of manual tuning.

2

Select whether you want to save the peak profile and spectrum of the standard sample observed in manual tuning or not. If [Yes] is selected, the following message will be displayed.

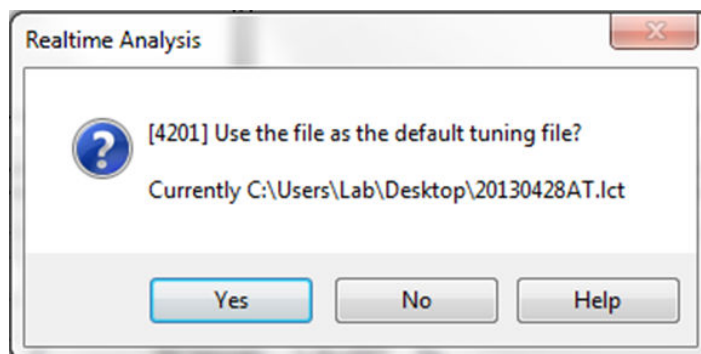


3

Select whether the saved tuning file is to be set as the default tuning file or not.

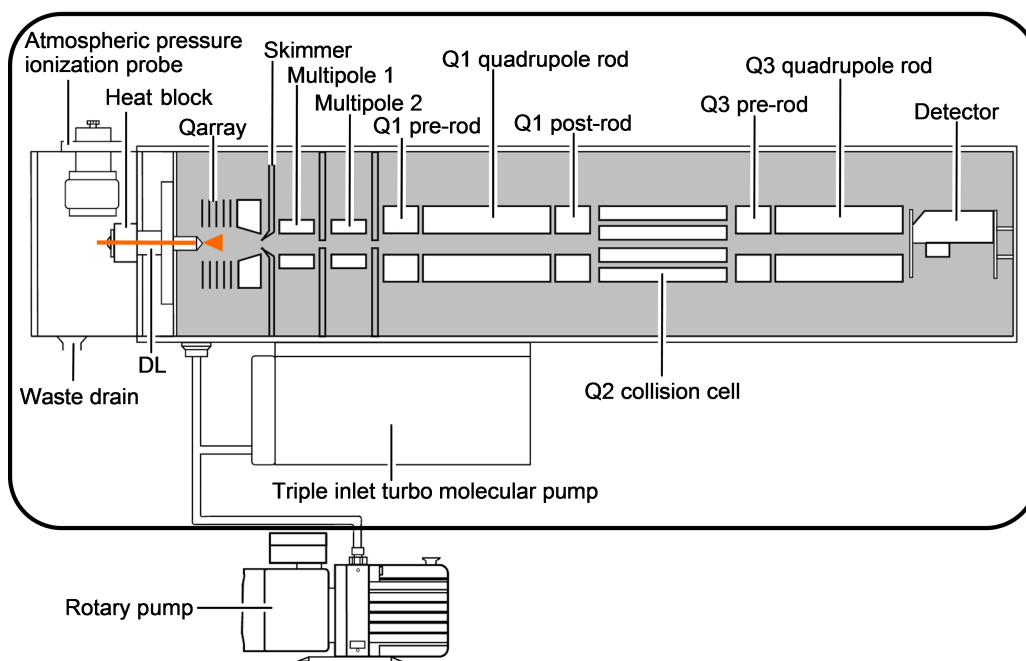
NOTE Select [No] since the manual tuning file is not normally used as the default tuning file.

▶▶ Reference "3.8.2 Starting Auto Tuning" P.84



8.2.3 Explanations of Parameters

Inside the LCMS-8050



■ Gas

Parameter Name	Default Value	Maximum	Minimum	Remarks
Nebulizer gas	3.0 L/min (ESI)	3.0 L/min (ESI, DUIS)	0.5 L/min (ESI, DUIS)	
	2.0 L/min (DUIS)	4.4 L/min (APCI)	0.5 L/min (APCI)	
	3.0 L/min (APCI)			
Drying gas	10 L/min (ESI, DUIS)	20 L/min*	3 L/min	Execute with auto tuning OFF
	5 L/min (APCI)			
Heating gas	10 L/min (ESI, DUIS)	20 L/min* (ESI, DUIS)	3 L/min (ESI, DUIS)	
CID gas	270	450	17	0 when turned OFF in the [System Control] window

- NOTE** An asterisk "*" indicates that the maximum flow rate is the sum of the flow rates for drying gas and heating gas.
 Examples
- When the flow rate for drying gas is 10 L/min, the rate for heating gas can be set up to 10 L/min.
 - When drying gas is OFF, the flow rate for heating gas can be set up to 20 L/min.

■ High voltage

Parameter Name	Default Value	Maximum	Minimum	Remarks
Interface HV	ESI, DUIS (+) 4.0 kV (-) -3.0 kV APCI (+) 4.5 kV (-) -3.5 kV	(+) 5.0 kV (-) -5.0 kV	ESI, APCI (+) 0.0 kV (-) 0.0 kV DUIS (+) 0.5 kV (-) -0.5 kV	
DUIS corona HV	(+) 4.5 kV (-) -3.5 kV	(+) 5.0 kV (-) 5.0 kV	(+) 2.0 kV (-) -2.0 kV	

■ Heater

Parameter Name	Default Value	Maximum	Minimum	Remarks
DL heater	250 °C	300 °C	50 °C	
Heat block	200 °C (APCI) 400 °C (ESI, DUIS)	300 °C (APCI) 500 °C (ESI, DUIS)	50 °C	
Interface heater	300 °C (ESI, DUIS) 350 °C (APCI)	400 °C (ESI, DUIS) 500 °C (APCI)	100 °C (ESI, DUIS) 50 °C (APCI)	

■ Lens voltage

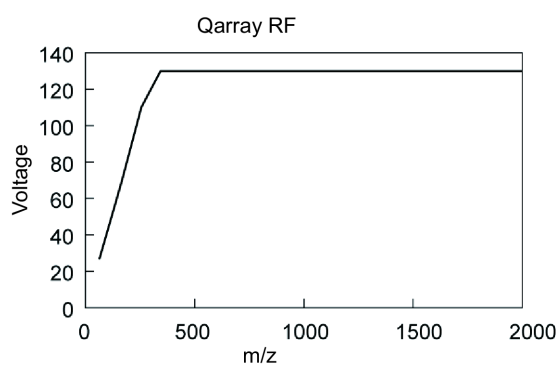
Parameter Name	Default Value	Maximum	Minimum	Remarks
DL	0 V	100 V	-100 V	
Qarray DC	0 V	240 V**	-240 V**	
Qarray RF	Depends on m/z * ¹	130 V	10 V	
Skimmer	0 V	0 V	0 V	Fixed
Multipole 1 DC	0 V	0 V	0 V	
Multipole 2 DC	(+) -1 V (-) +1 V	10 V	-10 V	
Multipole RF	Depends on m/z * ²	300 V	10 V	Same for multipole 1 and 2
Entrance lens 1	(+) -1 V (-) +1 V	10 V	-10 V	
Entrance lens 2	(+) -2 V (-) +2 V	50 V	-50 V	

NOTE Asterisks "***" indicate that the maximum/minimum voltage is the sum of the DL voltage and the Qarray DC.

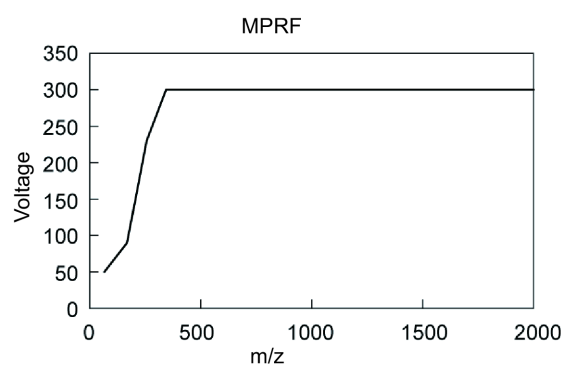
Examples

- When the DL voltage is 0 V, the Qarray DC can be set from -240 V to 240 V.
- When the DL voltage is 100 V, the Qarray DC can be set from -240 V to 140 V.
- When the DL voltage is -100 V, the Qarray DC can be set from -140 V to 240 V.

*1 Qarray RF



*2 Multipole RF

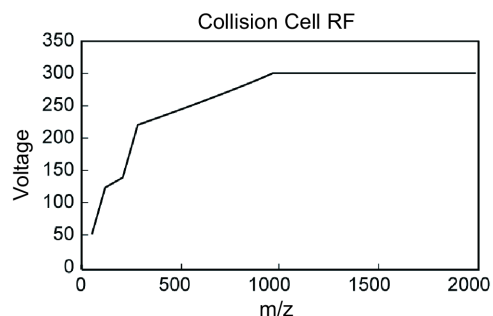
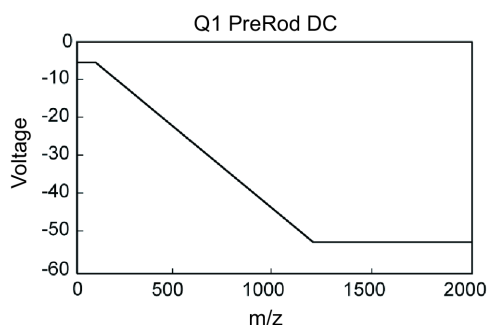


■ Analysis unit

Parameter Name	Default Value	Maximum	Minimum	Remarks
Q1 pre-rod DC	Depends on m/z * ¹	50 V	-50 V	
Q1 main rod DC	(+) -3.5 V (-) +3.5 V	50 V	-50 V	
Q1 post-rod DC	(+) -5 V (-) +5 V	50 V	-50 V	
Collision cell RF (CCRF)	Depends on m/z * ²	300 V	0 V	Optimized for each analysis mode
Collision energy	(+) -15 V (-) 30 V	180 V	-180 V	
Q3 pre-rod DC	Depends on m/z * ³	50 V	-50 V	Difference with CE
Q3 main rod DC	Depends on m/z * ⁴	50 V	-50 V	Difference with CE

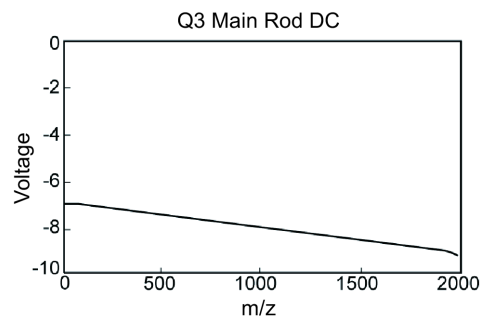
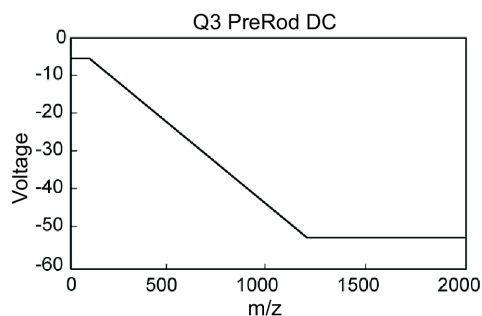
*1 Q1 pre-rod DC with positive ions
With negative ions, the positive and negative voltages are interchanged.

*2 Collision cell RF



*3 Q3 pre-rod DC with positive ions
With negative ions, the positive and negative voltages are interchanged.

*4 Q3 main rod DC with positive ions
With negative ions, the positive and negative voltages are interchanged.



■ Detector

Parameter Name	Default Value	Maximum	Minimum	Remarks
Conversion dynode	(+) -10 kV (-) 10 kV	(+) -10.0 kV (-) 10.0 kV	0 V	
Detector	-1.75 kV	-3.5 kV	0 V	

8.3 Standard Sample

For carrying out sensitivity adjustment and atomic mass number adjustment of the instrument, the LCMS-8050 uses a mixture of polyethylene glycol 200, 600, 1000, 2000 polypropylene glycol (PPG) and raffinose solution as the standard sample.

Standard sample P/N S225-14122-01 (200 mL)

Using this standard sample, auto tuning automatically performs sensitivity optimization and mass calibration.

8.3.1 Method for Preparing the Standard Sample

The method for preparing the standard sample is as follows.

The result is the same as P/N S225-14122-01 (200 mL).

1

Make up the dilution solvent.

Dilution solvent (when making approx. 1 L)

- Pure water: 800 mL
- Methanol: 200 mL
- Ammonium acetate: 14.5 mg

2

Make up the stock solution.

- 1 Dissolve the sample compounds indicated below in 100 mL of the dilution solvent described in step 1.

- PEG200: 15 µL
- PEG600: 1.0 µL
- PEG1000: 150 µL
- PEG2000: 100 µL

This is the stock solution.

(It is 100 times the concentration of the standard sample. However, it does not contain raffinose.)

PEG1000 is a solid at room temperature. To weigh it, warm it to around 60 °C to liquefy it, weigh it quickly in a disposable micro pipette and then dissolve it in the solvent.

3

Make up the standard sample for auto tuning.

- 1 Dilute the stock solution created in step 2 to 1/100th concentration using the dilution solution created in step 1.
- 2 Dissolve raffinose in this solution to achieve a concentration of 15 mg/L.

This completes the procedure.

The resulting concentrations are as indicated below.

- PEG200: 1.5 µL/L
- PEG600: 0.1 µL/L
- PEG1000: 15.0 µL/L
- PEG2000: 10.0 µL/L
- Raffinose: 15 mg/L

NOTE The PEG and PPG used for the standard sample easily stick to the equipment and are difficult to remove even by washing, so the pipette, containers, etc. used for weighing these compounds should not be used for the preparation of the mobile phase or reagents.
This will cause contamination of reagents and background noise during analysis.

8.3.2 Reagents

- | | | |
|--------------|-------|---|
| • PEG200: | 500 g | Wako Pure Chemical Industries P/N 167-09045 |
| • PEG600: | 500 g | Wako Pure Chemical Industries P/N 168-09075 |
| • PEG1000: | 500 g | Wako Pure Chemical Industries P/N 165-09085 |
| • PEG2000: | 500 g | Wako Pure Chemical Industries P/N 164-05895 |
| • Raffinose: | 5 g | Wako Pure Chemical Industries P/N 182-00011 |

Solvent

- | | | |
|------------------------------------|-------|--|
| • Methanol for LC use: | 1 L | P/N 017-40019-06 |
| • Distilled water for LC use: | 1 L | P/N 017-40513-01 |
| • Ammonium acetate, special grade: | 500 g | Wako Pure Chemical Industries
P/N 019-02835 |

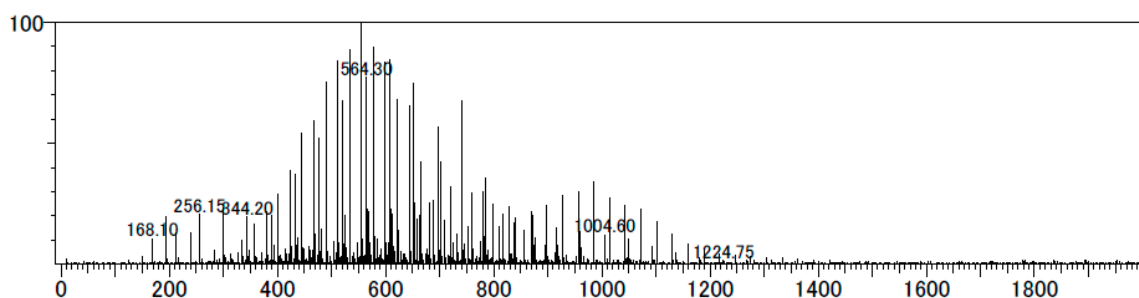
8.3.3 Mass of the Standard Sample

■ For the positive ionization mode

PEG (Polyethylene Glycol): $\text{HOCH}_2 (\text{CH}_2\text{OCH}_2)_n \text{CH}_2\text{OH}$

Auto tuning performs mass calibration using PEG+ NH_4 molecules with added ammonium ions.

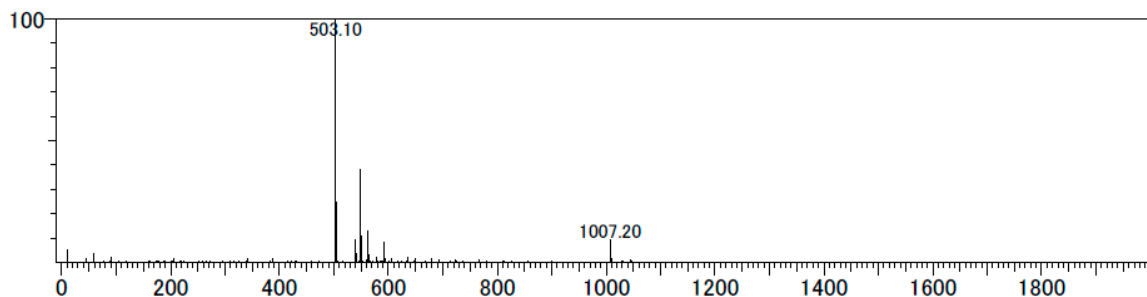
n=1	2	3	4	5	6	7
124.0974	168.1236	212.1498	256.176	300.2022	344.2284	388.2547
8	9	10	11	12	13	14
432.2809	476.3071	520.3333	564.3595	608.3857	652.4119	696.4382
15	16	17	18	19	20	21
740.4644	784.4906	828.5168	872.543	916.5692	960.5954	1004.622
22	23	24	25	26	27	
1048.648	1092.674	1136.7	1180.727	1224.753	1268.779	



■ For the negative ionization mode

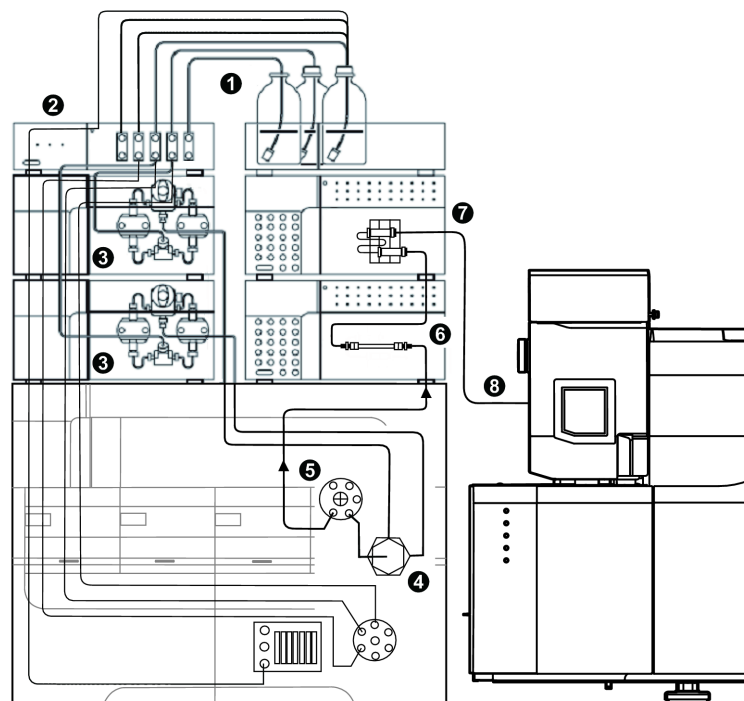
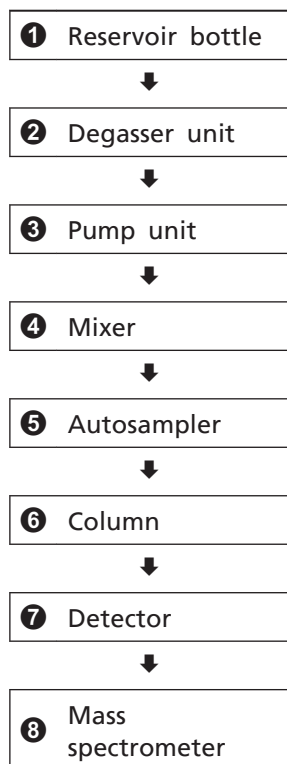
Raffinose: $\text{C}_{18}\text{H}_{32}\text{O}_{16}$

Auto tuning performs mass calibration using Raffinose 503.16 (M-H) deprotonated molecules and 1007.33 (2M-H) dimer ions.



8.4 Example Configuration of a High-Pressure Gradient System (Auto Injector)

■ Nexera X2 system



9 Specifications

9.1 Performance

Item	Specifications
Mass range	m/z 2 to 2000
Resolution	R = 2M (however, 50 % valley, 30 u/sec.)
Maximum scan speed	30000 u/sec
Positive/negative switching time	5 msec
MRM settings	Minimum Dwell Time: 0.8 msec Minimum Pause Time: 1 msec

9.2 Hardware

Item	Specifications
Interface section	ESI unit / APCI unit (option) / DUIS (option) and ion sampling unit
	Drying gas Max. flow rate 20 L/min* ►► Reference P.229
ESI unit	Sample flow rate (max.) 2 mL/min
	Probe voltage ±5 kV max.
	Nebulizer gas Max. flow rate 3.0 L/min
	Heating gas Max. flow rate 20 L/min* ►► Reference P.229
APCI unit (option)	Sample flow rate (max.) 2 mL/min
	Corona needle voltage ±5 kV max.
	Nebulizer gas Max. flow rate 4.4 L/min
DUIS (option)	Sample flow rate (max.) 1 mL/min
	Probe voltage ±5 kV max.
	Corona needle voltage ±5 kV max.
DL	Temperature 300 °C max. Voltage ±100 V
Heat block	Temperature 500 °C max. (ESI, DUIS) 300 °C max. (APCI)
Interface heater	Temperature 400 °C max. (ESI, DUIS) 500 °C max. (APCI)

Item	Specifications
<i>Analysis/detection section</i>	
Analysis rods	Hyperbolic quadrupole rods made of molybdenum, with pre-rods
Collision cell	Multipole type ultra high speed collision cell
Detector	Secondary electron multiplier with conversion dynode
Vacuum system	Triple inlet turbo molecular pump, 1 unit (triple inlet) Vacuum speed 40 L/s + 260 L/s + 210 L/s Rotary pump, 1 unit Vacuum speed 28 m ³ /h

 **NOTE** An asterisk "*" indicates that the maximum flow rate is the sum of the flow rates for drying gas and heating gas. For details, see the reference information.

9.3 Software

9.3.1 Analysis

Item	Specifications
Analysis conditions	Batch registration of the measurement conditions for the LC, the measurement conditions for the MS, and the conditions for data processing in the method, and registration of the report output format in the template file
MS Analysis	Q3 scan (max. 240 events), Q3 SIM (max. 1000 events × 32 channels) Q1 scan (max. 240 events), Q1 SIM (max. 1000 events × 32 channels)
MSMS analysis	MRM (max. 1000 events × 32 channels) Product ion scan (max. 310 events) Precursor ion scan (max. 256 events) Neutral loss scan (max. 225 events)
Automatic analysis	Automatic analysis can be performed through the combination of the auto injector (option) and the schedule function.

9.3.2 Data Processing

Item	Specifications
Data Processing	Drawing of LC chromatograms, MS chromatograms, and MS spectra Elimination of background noise in LC chromatograms Background subtraction and equalization for MS spectra Area calculations for LC chromatograms and MS chromatograms Calculation of column performance from LC chromatograms
Quantitative calculations	For both LC data and MS data Number of identified peaks: Max. 3000 Identification method: Absolute retention time method / relative retention time method, time band method /time window method, reference ions can be used (maximum of 5). Quantitative calculations: Correction percentage method (possible to add a scale factor), internal standard method, absolute calibration curve method (external standard), standard addition method Calibration curve: Straight line (method of least square, averaging method), broken line, quadratic curve, cubic curve, maximum of 64 calibration points (averaging up to 10 times is possible for each calibration point), weighting
Library search	Database: Private library Search modes: Similarity search, index search Number of libraries as simultaneous search targets: 5 max.
Library editing	Editing of the private library
Report output	LC chromatograms, MS chromatograms, MS spectra, profiles, LC peak tables, MS peak tables, MS status log, LC column performance reports, library search results, summary reports
Batch processing	Data processing by the scheduler, and continuous automatic processing of report output are possible.

9.3.3 Instrument Control

Item	Specifications
Instrument Control	Starting and stopping the MS unit Automatic and manual adjustment of the MS unit LC unit and MS unit diagnosis functions

9.3.4 User Management

Item	Specifications
User management	A maximum of 37 levels of privileges can be assigned to each user.

9.4 Installation Conditions

Item	Specifications
Required power supply	Single phase 230 V AC (50 Hz/60 Hz), 15 A Power for LC Refer to the specifications or the instruction manual provided with your LC. (The current capacity varies according to the configuration of the LC unit.)  NOTE For details on the power supply specifications of the computer, printer and peripheral equipment, check either the specifications or the instruction manuals of the devices you are using. The specifications given below are a rough guide. Power for PC Supply correct voltage to the PC or printer, etc. referring to the instruction manuals accompanying the PC or printer, etc.  CAUTION  Use a PC, printer, etc. that conform to your local laws and regulations. Instruction  NOTE As far as voltage fluctuation is concerned, the instrument is designed to operate adequately well provided the range of voltage fluctuation is within $\pm 10\%$ including the amplitude of the fast noise superimposed in the AC line, but the voltage fluctuation range required in order to guarantee the performance specifications is $\pm 5\%$ including noise. Grounding: 100 Ω max.

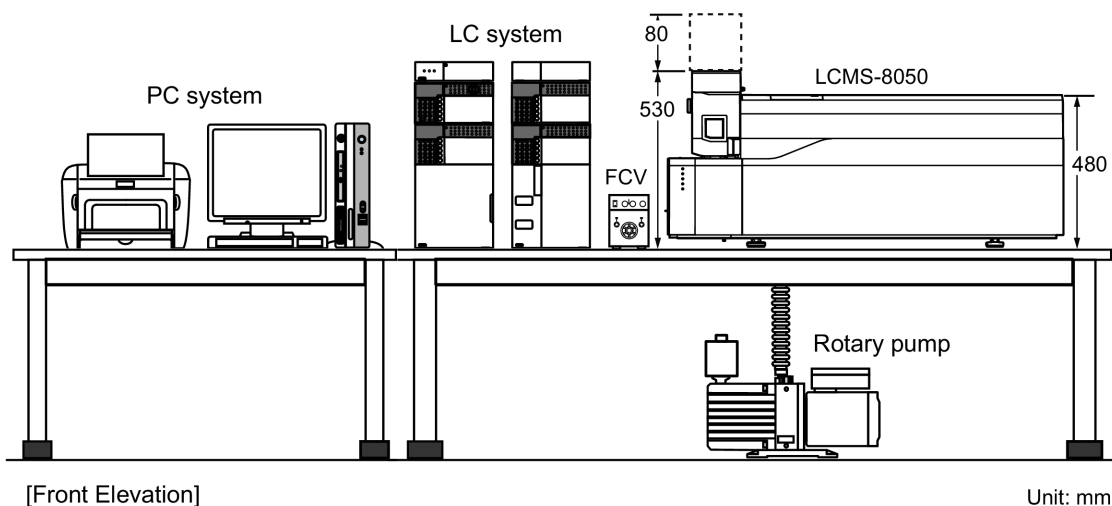
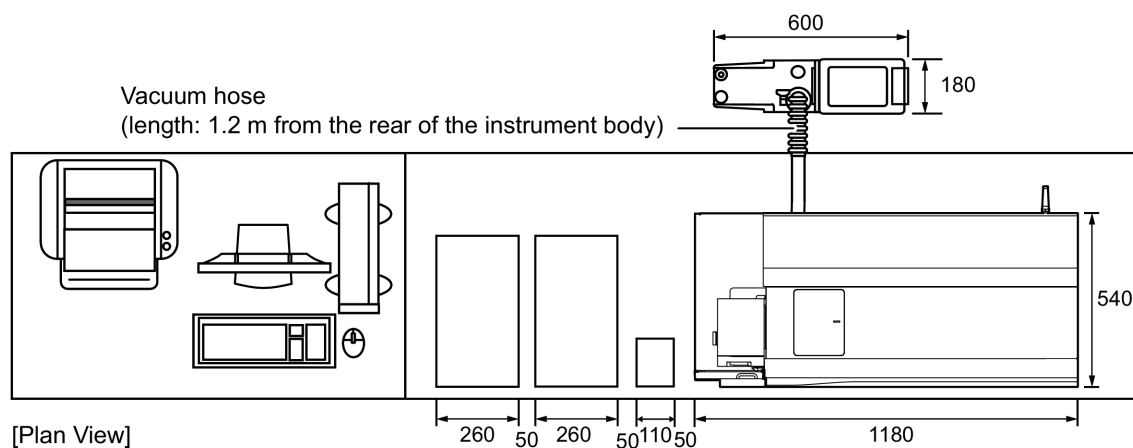
Item	Specifications	
Installation environment	Temperature	18 °C to 28 °C
	Humidity	20 % to 70 % (no dew condensation or electrostatic discharge)
	Other considerations	Install the instrument in an environment with little disturbance from dust, vibration, electromagnetic noise, corrosive gas, interfering magnetic fields, or other factors.
Exhaust gas	In order to process the exhaust gas of the rotary pump safely, an exhaust system such as a draft chamber is required.	
Required gas	<i>Nitrogen gas</i>	
	Supply pressure:	690 to 800 kPa
	Purity:	99.5 % or greater (For nitrogen gas generators): 97 % or greater
	Max. flow rate during use:	24.4 L/min (APCI)** 23.0 L/min (ESI, DUIS)**
	<i>Argon gas</i>	
	Supply pressure:	500 to 800 kPa
	Purity:	99.99 % or greater
	Flow rate during use:	Approx. 10 mL/min
	<i>Dry air</i>	
	Supply pressure:	690 to 800 kPa
	Purity:	Water-free, Oil-free
	Flow rate during use:	20 L/min*

▶▶ Reference P.229

- NOTE**
- An asterisk "*" indicates that the maximum flow rate is the sum of the flow rates for drying gas and heating gas. See the reference information.
 - Asterisks "***" indicate that the maximum flow rate is the sum of the flow rates for drying gas, heating gas, and nebulizer gas.

9.5 Example Installation

	Dimensions			Mass, kg
	W	D	H	
LCMS-8050	1180	540	610	140
Rotary pump	600	180	280	44



10 Maintenance Parts

10.1 Consumables

Part Name	Part No.	Remarks
<i>ESI unit</i>		
CAPILLARY ASSY	S225-14948-91	Set of tubes for ESI
PEEK TUBE 5999	S228-32999-01	
<i>APCI unit</i>		
APCI PIPE ASSY	S225-15845-91	SUS capillary tube
HEATER ASSY	S225-15619-41	APCI heater unit (with ferrule)
FERRULE	S225-03748-03	
<i>Needle unit</i>		
NEEDLE ASSY	S225-15877-92	Corona needle (for both APCI and DUIS)
<i>Interface ASSY</i>		
DL ASSY2	S225-15718-42	DL unit set (for the LCMS-8050)
ORIFICE	S225-15479	
SAMPLING CONE	S225-15487	
WASHER PEEK	S023-65106-01	Seal for fixed part of heater flange
<i>SI unit ASSY</i>		
TUBE, SI	S225-15848-91	Resistance tube, joints, tubing for LC
SPACER, FKM	S225-15697-01	Glass bottle packing
PEEK FRIT	S228-48607-91	Made of PEEK
Standard sample bottle	S038-00512-01	
Bottle cap	S225-15868-91	Standard sample bottle cap
Standard sample	S225-14122-01	
<i>Detection unit</i>		
EM, MS644	S225-14168-01	Secondary electron multiplier
<i>Vacuum system</i>		
RP OIL Ultragrade19 (4 L)	S017-30163-02	About 1.5 L used at each oil change
IG GAUGE	S225-09490-01	Vacuum gauge
FILAMENT FOR PB1, ROHS	S225-20310-91	Vacuum gauge (Pirani gauge)

10.2 Spare Parts

Part Name	Part No.	Remarks
<i>Waste tube</i>		
SILICON RUBBER TUBE, 7X10NL	S016-31350-19	Piping from the leak tray
PVC TUBE, R3603 1/2X3/4X1/8	S016-31414	Drain tube from the spray unit, for use outside the instrument
TUBE, SE-200 1/2-3/4	S016-37619-02	Drain tube from the spray unit, for use inside the instrument
<i>Vacuum system</i>		
TMP, SplitFlow 310	S225-14179-01	Triple inlet turbo molecular pump body + power supply
ROTARY PUMP, E2M28	-	For 230 V
CABLE ROTARY PUMP	S225-17224-41	Power supply cable for the rotary pump
LEAK VALVE ASSY	S225-03540-94	
HOSE TG-32	S018-31555-06	Use a 1.5 m RP intake hose (purchase unit: m)
HOSE, CHEMIFLEX 15MM	S016-31697-02	Use a 0.5 m TMP exhaust hose (purchase unit: m)
SLEEVE, PTFE 15X22 CL	S018-31511	Use a 5 m RP exhaust hose (purchase unit: m)
HOSE BAND, GEAR S 50	S037-61064	For spring hose #32
HOSE BAND, WIRE 24	S037-61023	For spring hose #15
HOSE BAND, WIRE SY-22	S037-61002	For vinyl hose 15 × 1.5
CENTERING RING, SNS7010	S035-06033-01	
CENTERING RING, SNS7025	S035-06033-03	
CLAMP, SNK1016	S035-06033-36	
CLAMP, SNK1025	S035-06033-37	
FLANGE PIPE, TQ-VAC	S225-12211-91	For RP intake
ELBOW, KF25-#15	S225-03535-91	For TMP back (TMP side)
FLANGE	S202-55374	For RP intake side (RP side)
O-RING, 4D G30	S036-12502	For RP intake
<i>Housing ASSY</i>		
O-RING, 4D P15	S036-11216	
O-RING, 4D P40	S036-11243	
O-RING, 4D-S56	S036-19004-41	
O-RING, AS568A-253 4D	S036-15552-53	
O-RING, AS568A-272 4D	S036-15552-72	
O-RING, AS568A-278 4D	S036-15552-78	
O-RING, AS568A-341 4D	S036-15553-41	

Part Name	Part No.	Remarks
O-RING, 4D P18	S036-11218	
O-RING, 4D P5	S036-11203	
PACKING 4TX14X22	S261-00207-02	For the ion gauge
<i>Interface section</i>		
BLOCK ASSY	S225-19615-41	Interface body
INSULATOR FLANGE	S225-15481	
PLATE, ORIFICE	S225-19639	
SOCKET ASSY	S225-15717-41	
BOLT, SST HEXSOCKET M6X16	S022-27104	
O-RING, 4D P4	S036-11202	
O-RING, 4D S8	S036-19004-05	
O-RING, 4D S14	S036-19004-11	
O-RING, 4D P6 NRF	S036-11342-04	
O-RING, 4D S18	S036-19004-14	
O-RING, 4D P30	S036-11233	
O-RING, 4D G100	S036-12517	
HEATER FLANGE ASSY	S225-19463-41	Heater flange body
BLOCK, HEATER	S225-15488	
INSULATOR BLOCK	S225-15489	
HEATER ASSY	S225-15716-41	
INSULATOR, FLANGE	S225-15491	
BUSH, HEATER	S225-15498	
O-RING, 4D S10	S036-19004-07	
<i>Ion source unit</i>		
PB CAP ASSY	S225-12313-41	Plastic cover
PB,L SIDE COVER	S225-12312	Plastic cover
PB FRONT COVER	S225-12311	Plastic cover
FRONT WINDOW	S225-19612-01	Window glass
SIDE WINDOW	S225-19612-02	Window glass
O-RING, 4D P95	S036-11267	
O-RING, 4D S18	S036-19004-14	
O-RING, 4D P30	S036-11233	
<i>ESI unit</i>		
HEATING ESI UNIT ASSY	S225-19550-41	ESI unit body
HEATER ASSY	S225-19560-41	
ESI HEATER	S225-25685	
TEMPERATURE SENSOR	S225-19560-42	
NEBULIZER NOZZLE	S225-19597	

Part Name	Part No.	Remarks
SUS COUPLING	S228-16447-03	
COUPLING	S225-14903	
MALE NUT, PEEK	S228-18565-84	5 included
O-RING, 4D P10	S036-11208	
O-RING, 4D S3	S036-19004-00	
O-RING, 4D S6	S036-19004-03	
O-RING, 4D S8	S036-19004-05	
O-RING, 4D S50	S036-19004-38	
O-RING, 4D S53	S036-19004-39	
O-RING, 4D S105	S036-19004-54	
O-RING, 4D S2	S036-19004-66	
HALF UNION, KQ2H23-M5A-ROHS	S035-65460-02	
ELBOW, KQ2L23-M5A-ROHS	S035-65461-31	
HALF UNION, GWJS3-M3	S035-65415-01	
INSULATOR HEATER	S225-19491	
INSULATOR	S225-19559	
AG INSULATOR, LONG	S225-19589	
<i>APCI unit</i>		
APCI UNIT ASSY	S225-19601-58	APCI probe, complete (excluding corona needle)
JOINT ASSY	S225-15788-91	
NUT	S225-15739	
ADAPTER	S225-04993	
NEEDLE UNIT ASSY	S225-14290-41	Common to APCI and DUIS
ELBOW, KQ2L23-M5A-ROHS	S035-65461-31	Gas joint
ELBOW UNION, GWJL3-0	S035-65415-28	Gas joint
<i>DUIS</i>		
NEEDLE UNIT ASSY	S225-14290-41	Common to APCI and DUIS
<i>Analysis unit</i>		
PRE-ROD ASSY	S225-03560-91	Common to Q1 and Q3
PRE-ROD ASSY	S225-03560-92	Common to Q1 and Q3
SPRING ASSY	S225-12257-91	Common to Q1 and Q3
PRE-ROD	S225-03552-01	Q1 post-rod
INSULATOR	S225-03553	For post-rod (pre-rod) coupling
NUT	S225-03554	For post-rod (pre-rod) coupling
PIN, POST ROD	S225-12258-42	Post-rod short
Q1 CABLE ASSY	S225-12270-91	Q1 cable
Q3 CABLE ASSY	S225-12270-92	Q3 cable

Part Name	Part No.	Remarks
BAND	S225-03566-03	Quadrupole rod tension plate
<i>Collision cell</i>		
CID_CELL_ASSY	S225-12070-43	CID cell (for the LCMS-8050)
BAND CID CELL	S225-12015	CID cell tension plate
COLLISION CELL CABLE ASSY	S225-14150-91	
O-RING, 4D-S4	S036-19004-01	
COLLISION CELL Lens1	S225-12217-42	
COLLISION CELL Lens2	S225-12218-42	
COLLISION CELL Lens3	S225-12219-42	
TQ-CC LENS6 PIN ASSY	S225-19344-42	
COLLISION CELL Plate	S225-14092-01	
<i>Detection unit</i>		
Detector ASSY	S225-14168	Detector, complete
EM, MS644	S225-14168-01	Secondary electron multiplier only
EM HV CABLE ASSY	S225-12292-91	Cable for detector voltage supply
EM SIG CABLE ASSY	S225-12293-91	Signal cable
<i>Lens system</i>		
Qarray ASSY	S225-12030-91	Qarray + skimmer
SKIMMER	S225-12034-01	
QP1 ASSY	S225-13646-41	Qarray side multipole ASSY
QP2 ASSY	S225-13648-41	Q1 side multipole ASSY
QP1 Lens	S225-13630-01	Entrance lens of the QA side multipole ASSY
QP2 Lens	S225-12052-01	Entrance lens of the Q1 side multipole ASSY
<i>SI unit</i>		
MANIFOLD, SI	S225-15695-91	Manifold
HALF UNION, GWJS6-M5	S035-65415-06	Gas joint
HOUSING, LINEFILTER	S228-46358	
PEEK TUBE 1.6X0.25	S228-32999-03	Use 95 mm (purchase unit: m)
MALE NUT, PEEK	S228-18565-84	5 included
BRACKET, SI	S225-15560	Mounting plate
<i>Gas control system</i>		
GAS Controller ASSY2	S225-12008-42	Gas control unit set (for nebulizer gas, drying gas, and CID gas, for the LCMS-8050)
FEP TUBE 1/16, NEB	S225-14255-41	For nebulizer gas
FEP TUBE 4 mm, DRY	S225-14255-42	For drying gas
FEP TUBE 1/16, DRY	S225-14255-43	For drying gas

Part Name	Part No.	Remarks
POLYURETHANE TUBE, U2-4-6X4BK	S016-46021	
VALVE ASSY (NEB)	S040-51226-01	
VALVE ASSY (DRY, HEAT)	S225-14292-41	Common to drying gas and heating gas
VALVE ASSY SAGINOMIYA	S221-48813-91	
FEP TUBE 6 mm, GAS	S225-15846-93	
TUBE JOINT, M	S225-10766-91	For conversion from M type (option)
TUBE JOINT, 6.4	S225-15849-91	For conversion from 6.4 mm (option)
FILTER, 2300B-SS-1/8-2U	-	
FILTER ASSY	S225-14042-41	Heating gas filter
REGULATOR, AR10-M5BG-A-ROHS	-	For CID gas pressure reduction
PCB ASSY, TQ-FLOW2	S225-17010-43	PCB (for the LCMS-8050 maintenance (adjusted), nebulizer gas, drying gas, and CID gas)
20L GAS CONTROLL ASSY	S225-19553-42	Gas control set (for heating gas)
<i>CID gas vacuum introduction unit</i>		
CID VALVE ASSY	S225-12103-41	
CID GAS INLET ASSY	S225-12131-41	CID gas introduction unit, complete
CID GAS CAPILLARY	S225-12131-42	Capillary and connection parts only
<i>Fan</i>		
FAN-ASSY	S225-14263-41	Main power supply, TMP cooling fan
MIDDLE CHASSIS FAN ASSY	S225-25694-41	Fan for middle chassis
FAN60MM ASSY	S225-09853-41	Fan for CID-RF power supply
RF FAN ASSY	S225-12151-41	For the main RF power supply
FILTER	S042-60935-14	Filter media only
<i>Cover</i>		
TOP COVER	-	Top panel
FRONT COVER	-	Cover for the front surface
LEFT PANEL	-	Left side panel
RIGHT COVER ASSY	-	Right side panel
OP COVER	-	Multipole maintenance section cover
SI_DOOR	S225-19435	SI_cover

■ Electrical parts

Part Name	Part No.	Remarks
<i>Main power supply</i>		
PCB ASSY, TQ-HPSCONT HP	S225-16940-42	
PCB ASSY, TQ-DCDCPS	S225-16950-40	
POWER SUPPLY, ZWS240BP-24	S074-80751-01	
POWER SUPPLY, ZWS150BAF-24	S074-80744-05	
POWER SUPPLY, ZWS100BAF-24	S074-80744-15	
POWER SUPPLY, LFA30F-5-J1Y	S074-80441-67	
HEATER TRANS 110V ASSY	S225-13518-42	Heater transformer
FILTER, RSEN-2016	S075-00186-04	Noise filter
BREAKER, TA45-ABDRL150C0	S065-90199-39	Power switch
CABLE, MAIN POWER	S225-17112-41	
<i>Control system</i>		
PCB ASSY, TQ-CPU	S225-16900-41	CPU
PCB ASSY, TQ-LENSDC	S225-16930-41	LENS
PCB ASSY, TQ-ANALOG	S225-16920-41	ANALOG
<i>CDL transformer</i>		
LCMS CDLTRANS2	S225-13515	For the CDL heater
<i>High-voltage power supply</i>		
TQ-HV SIG ASSY (UF)	S225-17099-42	High-voltage power supply unit for detector
HV IF SUB ASSY (UF)	S225-13347-42	High-voltage power supply unit for interface
CABLE,IF HV OUTPUT PR	S225-19490-41	HV cable for IF
HV DUAL SUB ASSY (UF)	S225-13348-42	High-voltage power supply unit for DUIS
CABLE,IF HV OUTPUT NED	S225-19490-42	HV cable for DUIS
CABLE, NED HV INPUT	S225-13599-41	Flat cable for DUIS
PCB ASSY, IF HV-R	S225-11960-41	Output resistor PCB for IF
PCB ASSY, DUIS-R	S225-11960-42	Output resistor PCB for DUIS
HV CABLE ASSY	S225-19461-41	HV cable for IF
HV CABLE N ASSY	S225-19461-42	HV cable for DUIS
<i>RF power supply</i>		
TQ-MAIN-RF	S225-12281-42	Main RF power supply shared by Q1 and Q3
TQ-QP-OP PS ASSY	S225-12161-41	Qarray, multipole RF power supply
TQ-CID PS ASSY	S225-12162-41	CID cell RF power supply
PCB ASSY, TQ-CNOR2	S225-17060-42	Relay PCB for Qarray, multipole RF power supply

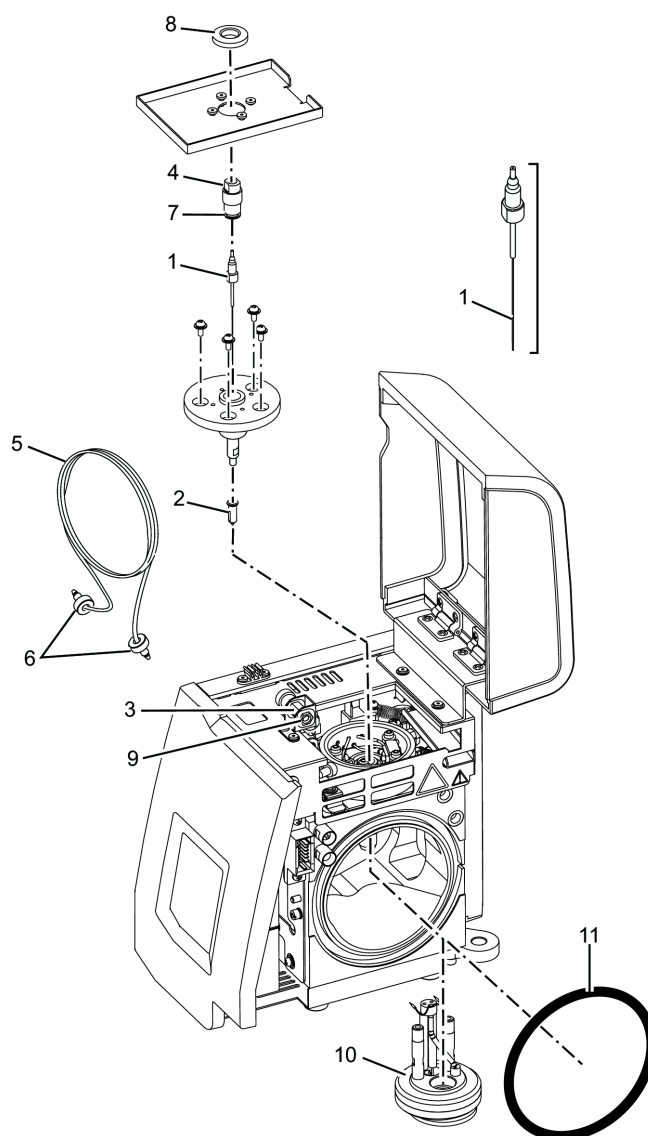
Part Name	Part No.	Remarks
PCB ASSY, TQ-CNCR2	S225-17070-42	Relay PCB for collision cell RF power supply
PCB ASSY, FT-Q1 maintenance	S225-17050-43	Main RF power supply relay PCB for Q1
PCB ASSY, FT-Q3 maintenance	S225-17050-44	Main RF power supply relay PCB for Q3
<i>Detector</i>		
BOARD, PRE AMP	S225-16960-41	
<i>LED</i>		
PCB ASSY, LCMS-LED	S225-13480-41	PCB ASSY, LCMS-LED
<i>Start signal</i>		
CABLE, LCMS EVENT	S225-17126-41	MS-LC event cable
<i>Analog output</i>		
CABLE, TQ-ANALOG	S225-17128-41	MS-FRC analog cable
<i>USB cable</i>		
CABLE, PC-MS ASSY	S225-17125-41	USB cable
<i>Cable for FCV</i>		
CABLE, TQ-FCV	S225-17127-41	MS-FCV signal cable

10.3 Unit Configurations

Part Name	Part No.	Remarks
ESI UNIT	S225-19550-41	
APCI UNIT	-	
NEEDLE UNIT ASSY	S225-14290-41	Common to APCI and DUIS
IF BLOCK ASSY	S225-19615-41	
HEATER FLANGE ASSY	S225-19463-41	
DL PIPE ASSY2	S225-15718-42	For the LCMS-8050
ORIFICE PART	-	
SPRAY UNIT	-	
LENS UNIT	-	
DETECTOR UNIT	-	
Qarray ASSY	S225-12030-91	
QP1 ASSY	S225-13646-41	
QP2 ASSY	S225-13648-41	
VACUUM UNIT	-	
ION GAGE	-	
PIRANI GAGE	-	
DRAIN TUBE	-	
STANDARD SAMPLE SOURCE	-	
NEBULIZER GAS	-	
ACCESORY	-	
STARTUP KIT	S225-13915-45	
OIL RETURN KIT	S225-05990-92	

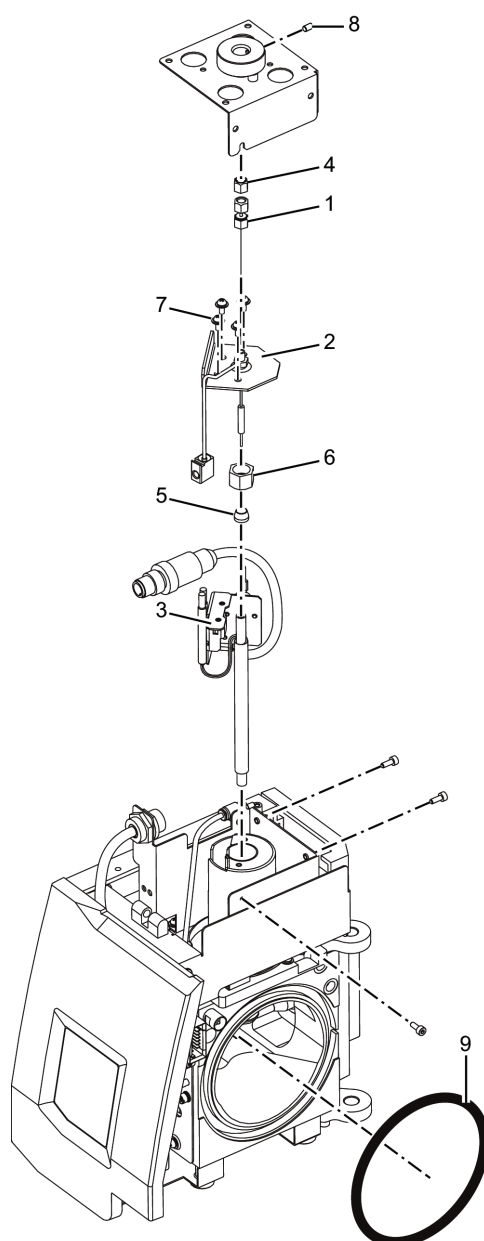
10.3.1 ESI Unit: S225-19550-41

No.	Part Name	Part No.	Remarks
1	CAPILLARY ASSY	S225-14948-91	Capillary ASSY consumables
2	NEBULIZER NOZZLE	S225-19597	
3	COUPLING, 1.6	S228-16447-03	SUS
4	COUPLING	S225-14903	PEEK (for securing capillary tube)
5	PEEK TUBE 5999	S228-32999-01	Use 420 mm (purchase unit: m)
6	MALE NUT, PEEK	S228-18565-84	5 included
7	O-RING, 4D-S8	S036-19004-05	
8	NUT, KNURL	S225-14914	For securing the capillary tube
9	NUT, RID-6A	S228-16034	For securing the SUS, coupling
10	HEATER ASSY	S225-19560-41	
11	O-RING, 4D-P95	S036-11267	



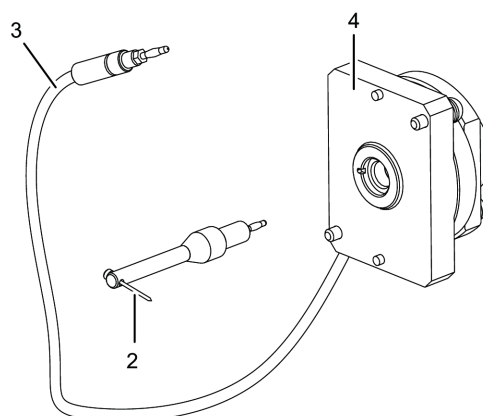
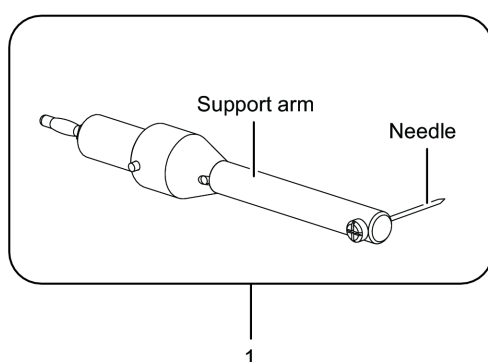
10.3.2 APCI Unit

No.	Part Name	Part No.	Remarks
1	APCI PIPE ASSY	S225-15845-91	
2	JOINT ASSY	S225-15788-91	
3	HEATER ASSY	S225-15619-41	
4	ADAPTER	S225-04993	
5	FERRULE	S225-03748-03	
6	NUT	S225-15739	
7	SCREW, SST SEMS P3 M3X8	-	Four
8	SET SCREW M3X5	-	One
9	O-RING, 4D-P95	S036-11267	



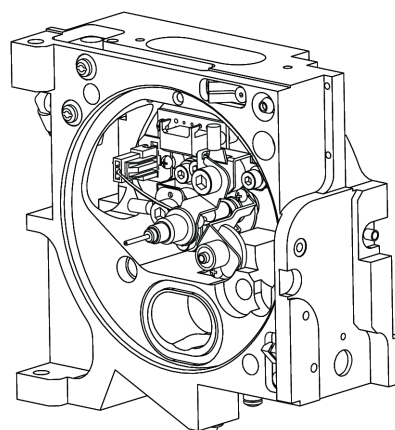
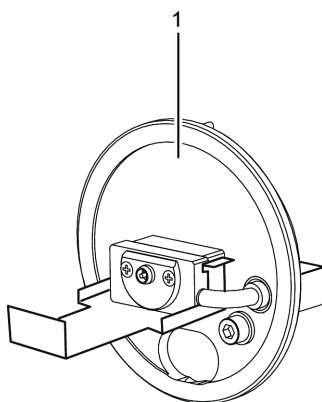
10.3.3 Corona Needle ASSY

No.	Part Name	Part No.	Remarks
1	NEEDLE UNIT ASSY	S225-14290-41	Including needle and support arm
2	NEEDLE ASSY D	S225-15877-92	Needle only
3	NEEDLE SOCKET CABLE	S225-19473-41	Used in common with APCI
4	NEEDLE SOCKET ASSY	S225-19609-41	Including high-voltage cable



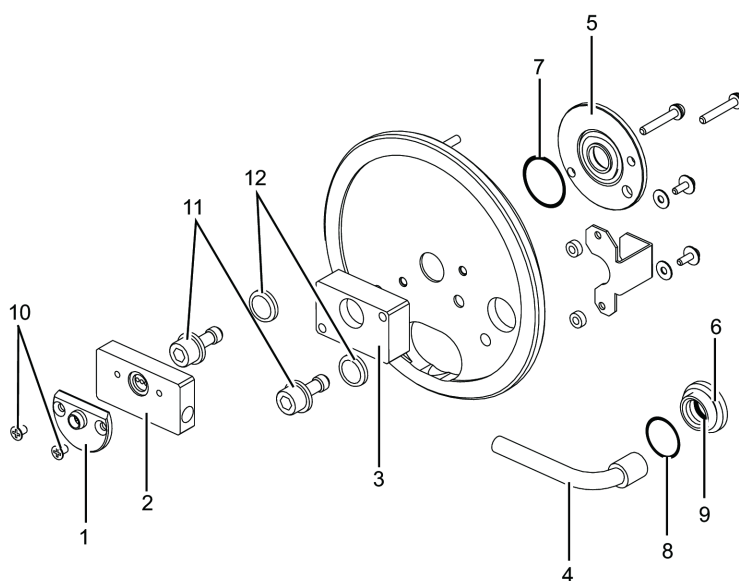
10.3.4 IF Flange ASSY

No.	Part Name	Part No.	Remarks
1	HEATER FLANGE ASSY	S225-19463-41	



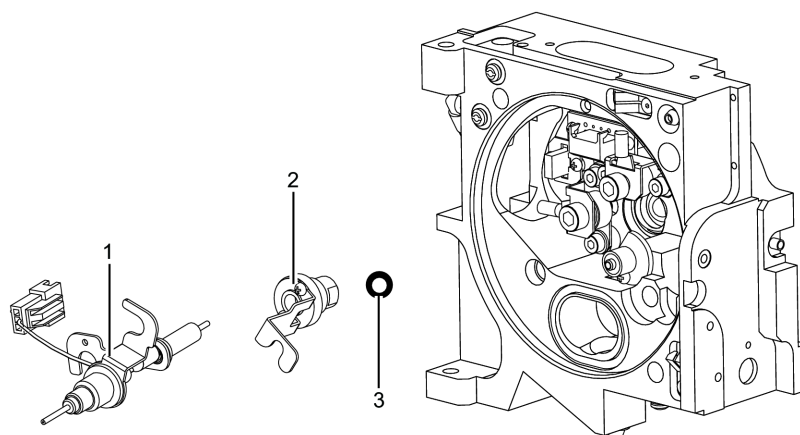
■ Heater Flange ASSY

No.	Part Name	Part No.	Remarks
1	SAMPLING CONE	S225-15487	
2	BLOCK, HEATER	S225-15488	
3	INSULATOR BLOCK	S225-15489	
4	HEATER ASSY	S225-15716-41	
5	INSULATOR, FLANGE	S225-15491	
6	BUSH, HEATER	S225-15498	
7	O-RING, 4D-S18	S036-19004-14	
8	O-RING, 4D S14	S036-19004-11	
9	O-RING, 4D-S10	S036-19004-07	
10	SCREW, SST FLAT HEAD M3X5	S225-14287-41	Two
11	BOLT M6X16	S225-19636	Two
12	WASHER	S023-65106-01	Two



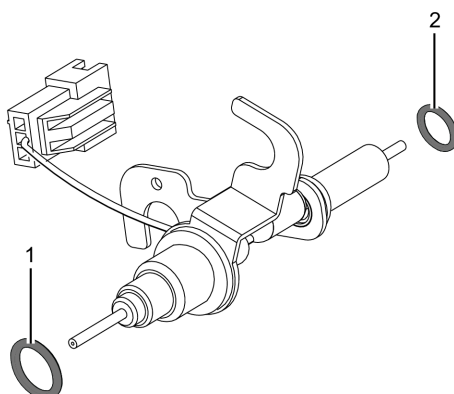
■ IF Block

No.	Part Name	Part No.	Remarks
1	DL PIPE ASSY2	S225-15718-42	With O-rings (2 locations), For the LCMS-8050
2	ORIFICE PART	-	
3	O-RING, 4D P4	S036-11202	



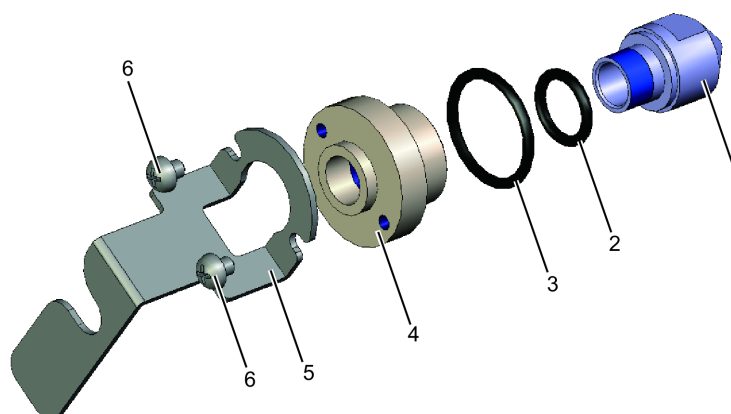
■ DL (Desolvation Line)

No.	Part Name	Part No.	Remarks
1	O-RING, 4D P10	S036-11208	
2	O-RING, 4D-S6	S036-19004-03	



■ ORIFICE unit

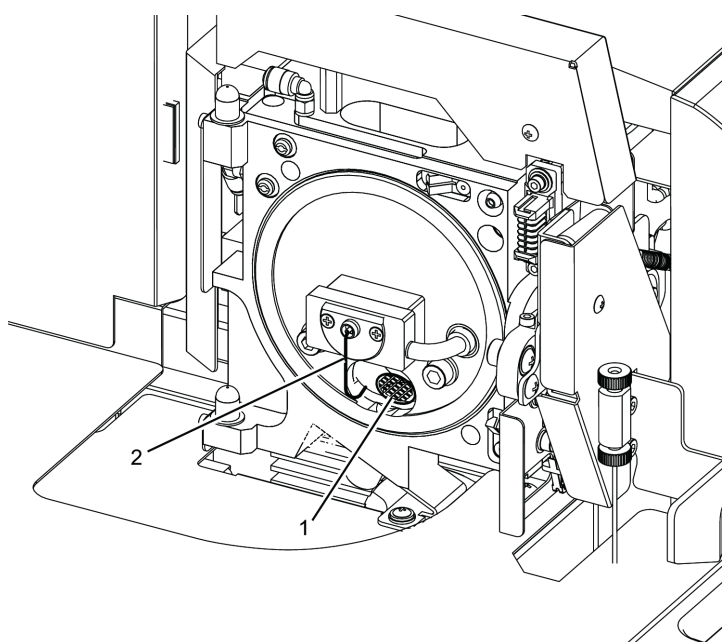
No.	Part Name	Part No.	Remarks
1	ORIFICE	S225-15479	
2	O-RING, 4D S8	S036-19004-05	
3	O-RING, 4D S14	S036-19004-11	
4	INSULATOR FLANGE	S225-15481	
5	PLATE, ORIFICE	S225-19639	
6	SCREW, SST PAN HEAD M2.5X3	-	Two



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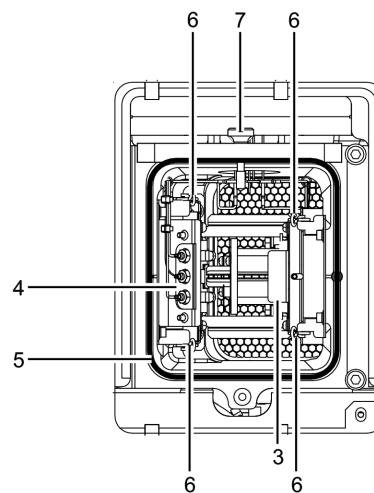
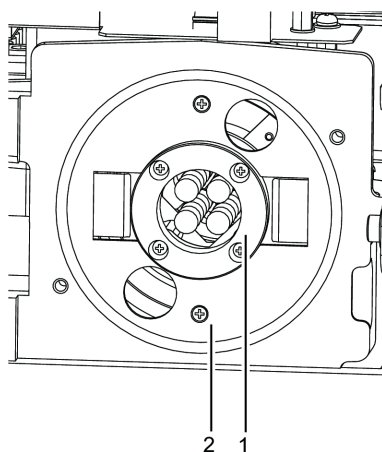
10.3.5 Spray Unit

No.	Part Name	Part No.	Remarks
1	GUARD	-	
2	DL PLUG2	S225-25691	DL cover



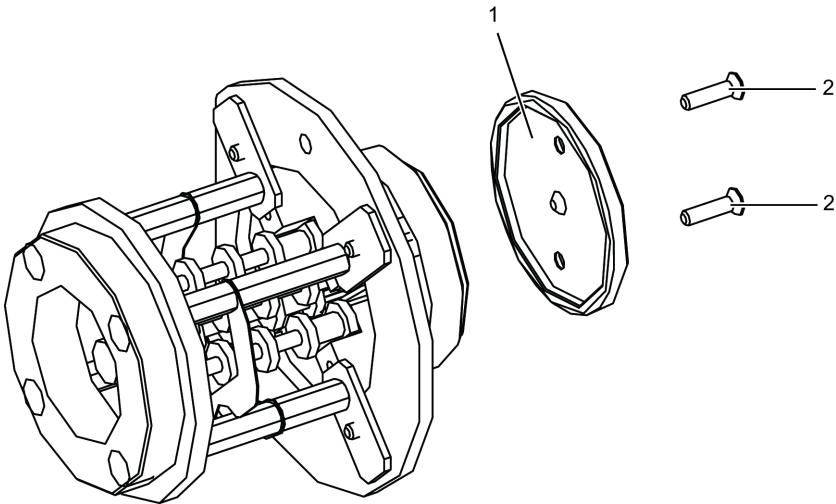
10.3.6 Lens System

No.	Part Name	Part No.	Remarks
1	Qarray ASSY	S225-12030-91	Qarray + skimmer, complete
2	SPACER	S225-12215-91	
3	QP1 ASSY	S225-13646-41	Multipole 1 + entrance lens, complete
4	QP2 ASSY	S225-13648-41	Multipole 2 + entrance lens, complete
5	O-RING, AS568A-253 4D	S036-15552-53	
6	HOOK	S225-12029	
7	KNOB, KNURLED SUS M5-27 WITH W*	S037-02788-01	



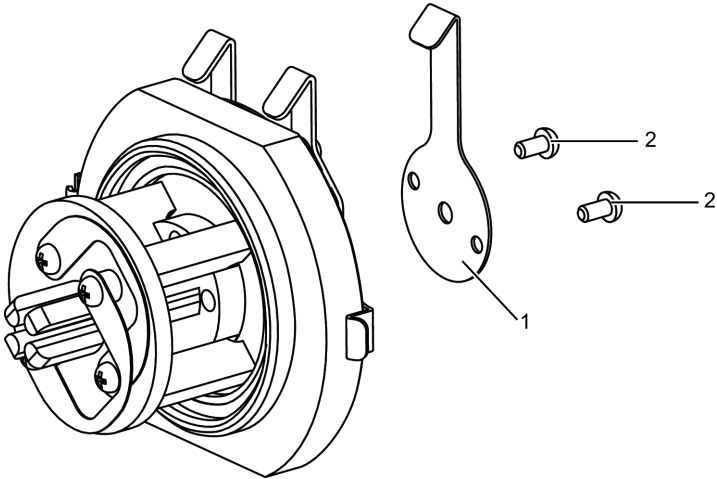
■ Qarray ASSY: S225-12030-91

No.	Part Name	Part No.	Remarks
1	SKIMMER	S225-12034-01	
2	SCREW, SST FLAT HEAD M3X12	S020-12107	Two



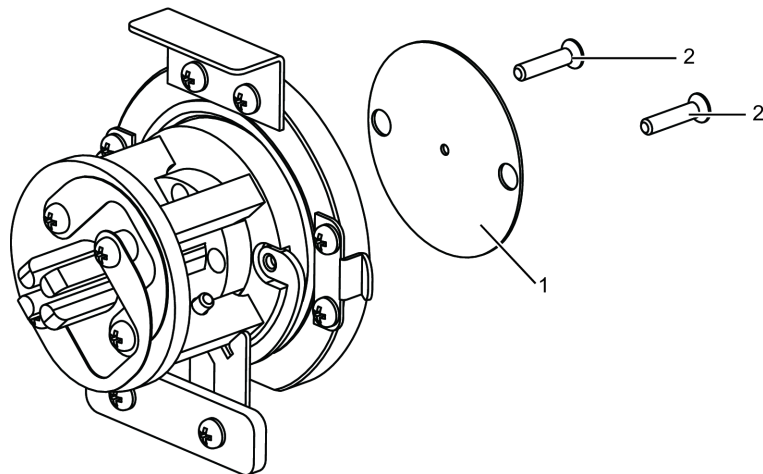
■ QP1 ASSY: S225-13646-41

No.	Part Name	Part No.	Remarks
1	QP1 LENS	S225-13630-01	
2	SCREW,SST SEMS P3 M3X6	S020-46534	



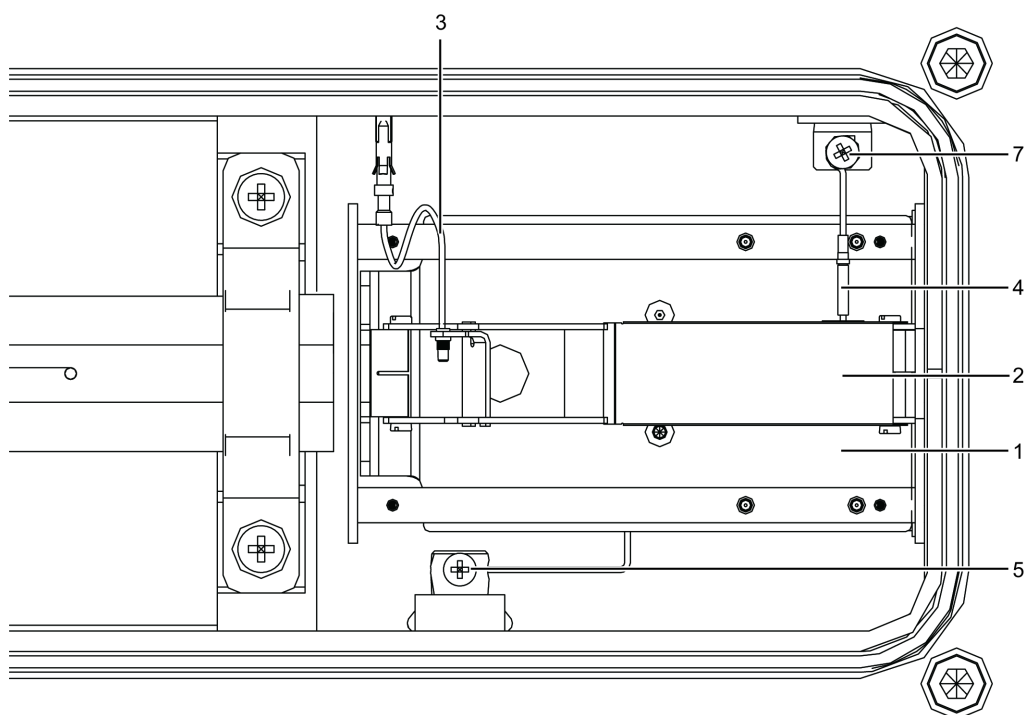
■ QP2 ASSY: S225-13648-41

No.	Part Name	Part No.	Remarks
1	OP2/QP2 LENS	S225-12052-01	
2	SCREW, SST FLAT HEAD M3X16	S020-12109	



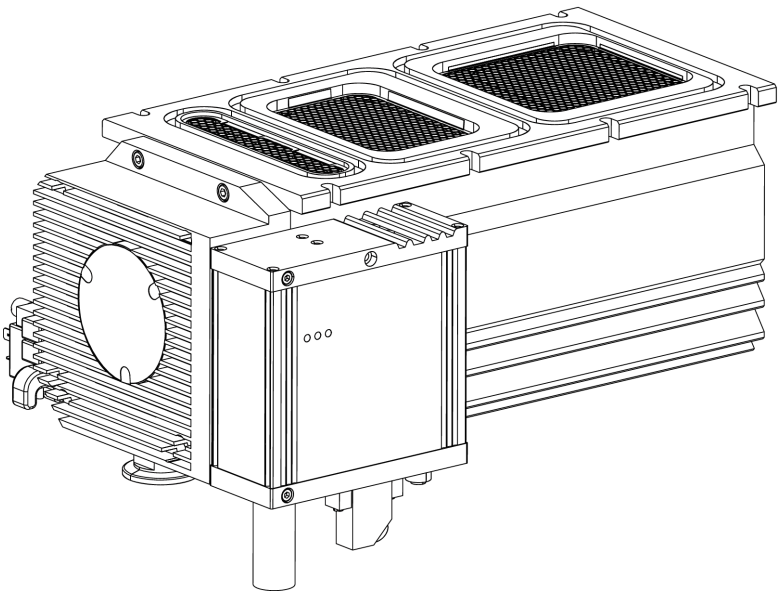
10.3.7 Detection Unit

No.	Part Name	Part No.	Remarks
1	DETECTOR	S225-14168	Detector, complete
2	ELECTRON MULTIPLIER	S225-14168-01	
3	Cable 1	S225-12292-91	For high voltage
4	Cable 2	S225-12293-91	For signals
5	SCREW, SST PAN HEAD M3X6	-	One
6	BOLT, SST HEXSOCH SEMS P3 M3X8	-	Two
7	SCREW, SST SEMS P4 M3X10	-	One



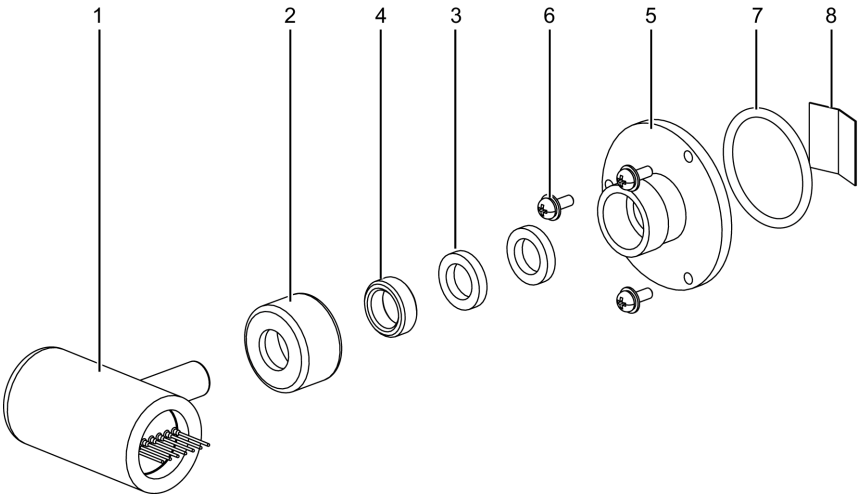
10.3.8 Vacuum System

No.	Part Name	Part No.	Remarks
1	RP OIL Ultragrade19 (4 L)	S017-30163-02	About 1.5L used at each oil change
2	IG GAUGE	S225-09490-01	Ion gauge vacuum gauge
3	FILAMENT FOR PB1, ROHS	S225-20310-91	Pirani gauge vacuum gauge
4	TMP, SplitFlow 310	S225-14179-01	Triple inlet turbo molecular pump body + power supply
5	ROTARY PUMP, E2M28	-	For 230 V
6	CABLE, RP ASSY	S225-17224-41	Power supply cable for the rotary pump
7	LEAK VALVE ASSY	S225-03540-94	
8	HOSE TG-32	S018-31555-06	Use a 1.5 m RP intake hose (purchase unit: m)
9	HOSE, CHEMIFLEX 15MM	S016-31697-02	Use a 0.5 m TMP exhaust hose (purchase unit: m)
10	SLEEVE, PTFE 15X22 CL	S018-31511	RP exhaust hose (purchase unit: m)
11	HOSE BAND, GEAR S 50	S037-61064	For spring hose #32
12	HOSE BAND, WIRE 24	S037-61023	For spring hose #15
13	HOSE BAND, WIRE SY-22	S037-61002	For vinyl hose 15 x 1.5
14	CENTERING RING, SNS7010	S035-06033-01	
15	CENTERING RING, SNS7025	S035-06033-03	
16	CLAMP, SNK1016	S035-06033-36	
17	CLAMP, SNK1025	S035-06033-37	
18	FLANGE PIPE, TQ-VAC	S225-12211-91	
19	ELBOW, KF25-#15	S225-03535-91	
20	FLANGE	S202-55374	For RP intake
21	O-RING, 4D P14	S036-11215	Drain seal
22	O-RING, 4D G50	S036-12506	Seal for the ionization probe
23	O-RING, 4D G100	S036-12517	Seal for the probe holder
24	O-RING, 4D P26	S036-11228	Seal for DUIS
25	O-RING, 4D P15	S036-11216	Pirani, hermetic seal
26	O-RING, 4D P40	S036-11243	For IG, feed-through
27	O-RING, AS568A-253 4D	S036-15552-53	OP cover
28	O-RING, AS568A-272 4D	S036-15552-72	Q3 cover
29	O-RING, AS568A-278 4D	S036-15552-78	Q1 cover
30	O-RING, AS568A-341 4D	S036-15553-41	Front and back housing
31	O-RING, 4D P18	S036-11218	For feed-through
32	O-RING, 4D P5	S036-11203	Feed-through conversion



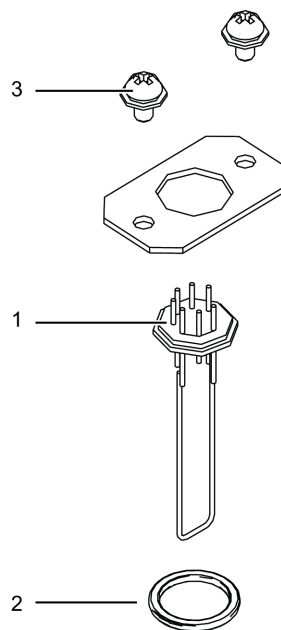
■ Ion Gauge Vacuum Gauge

No.	Part Name	Part No.	Remarks
1	IG GAUGE	S225-09490-01	
2	SACK NUT	S261-00210	
4	GASKET PRESS	S261-00209	
3	PACKING 4TX14X22	S261-00207-02	2 pc
5	FLANGE	S225-10150-01	
6	SCREW, SST SEMS P3 M4X12	-	Three
7	O-RING, 4D P40	S036-11243	For IG
8	BAFFLE	S225-15534	



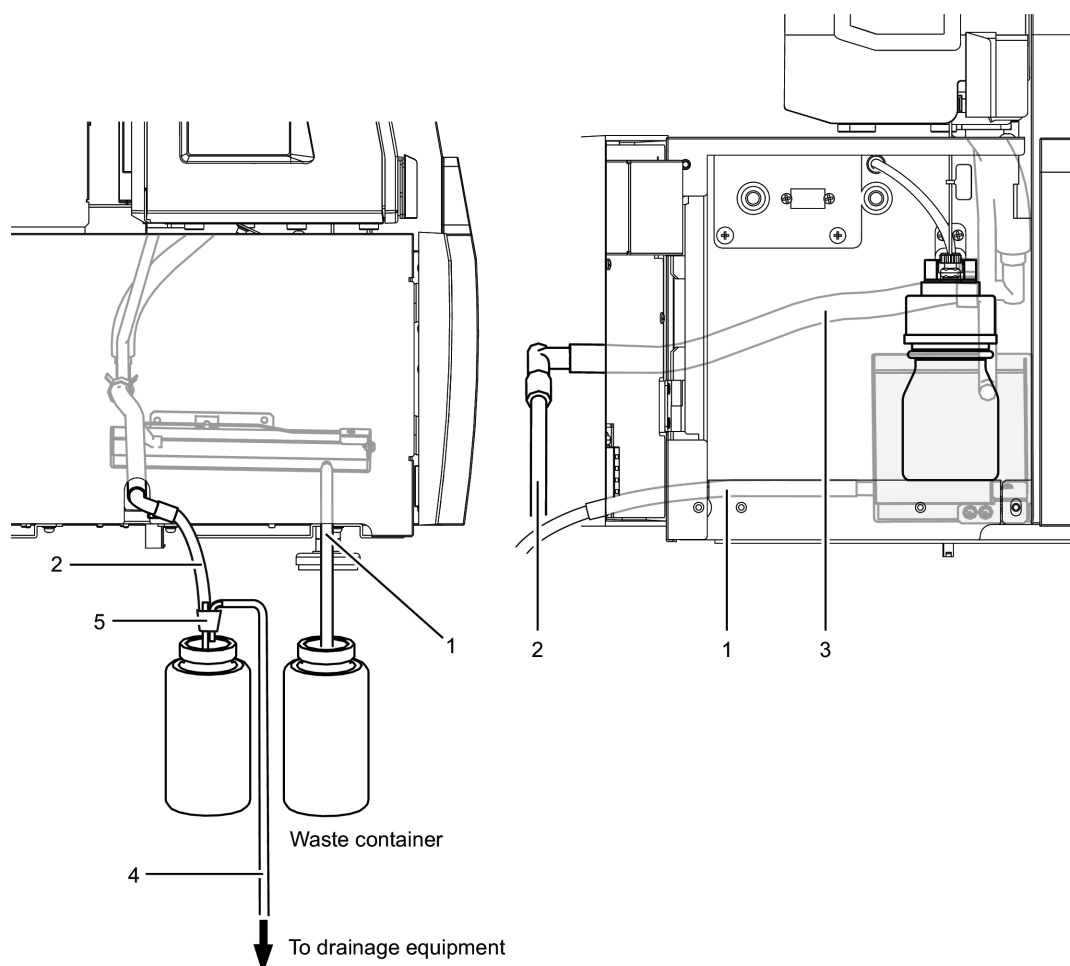
■ Pirani Gauge Vacuum Gauge

No.	Part Name	Part No.	Remarks
1	FILAMENT FOR PB1, ROHS	S225-20310-91	
2	O-RING, 4D P15	S036-11216	For the Pirani gauge
3	SCREW, SST SEMS P3 M4X8	-	



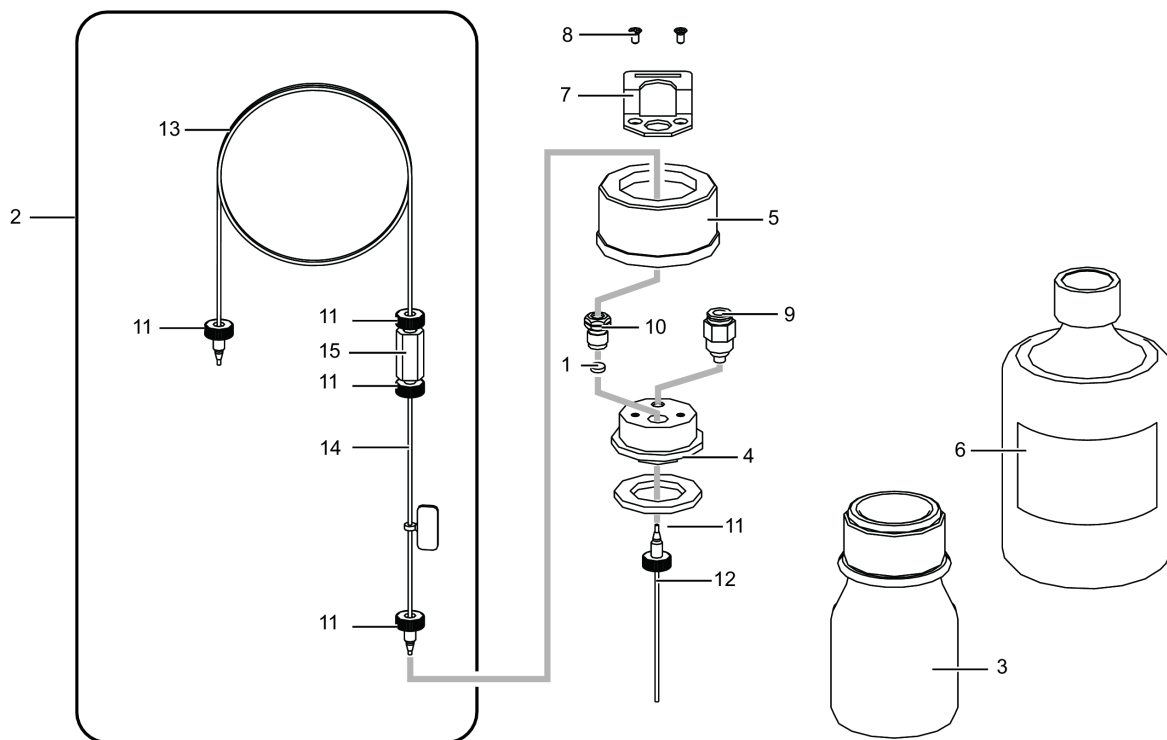
10.3.9 Waste Tube

No.	Part Name	Part No.	Remarks
1	SILICON RUBBER TUBE, 7X10NL	S016-31350-19	1 m drain tube from the leak tray
2	PVC TUBE, R3603 1/2X3/4X1/8	S016-31414	1 m drain tube from the spray unit, for use outside the instrument
3	TUBE, SE-200 1/2-3/4	S016-37619-02	320 mm drain tube from the spray unit, for use inside the instrument
4	SLEEVE, PTFE 12X3	S018-31510	5 m
5	RUBBER CAP	S225-06482-92	



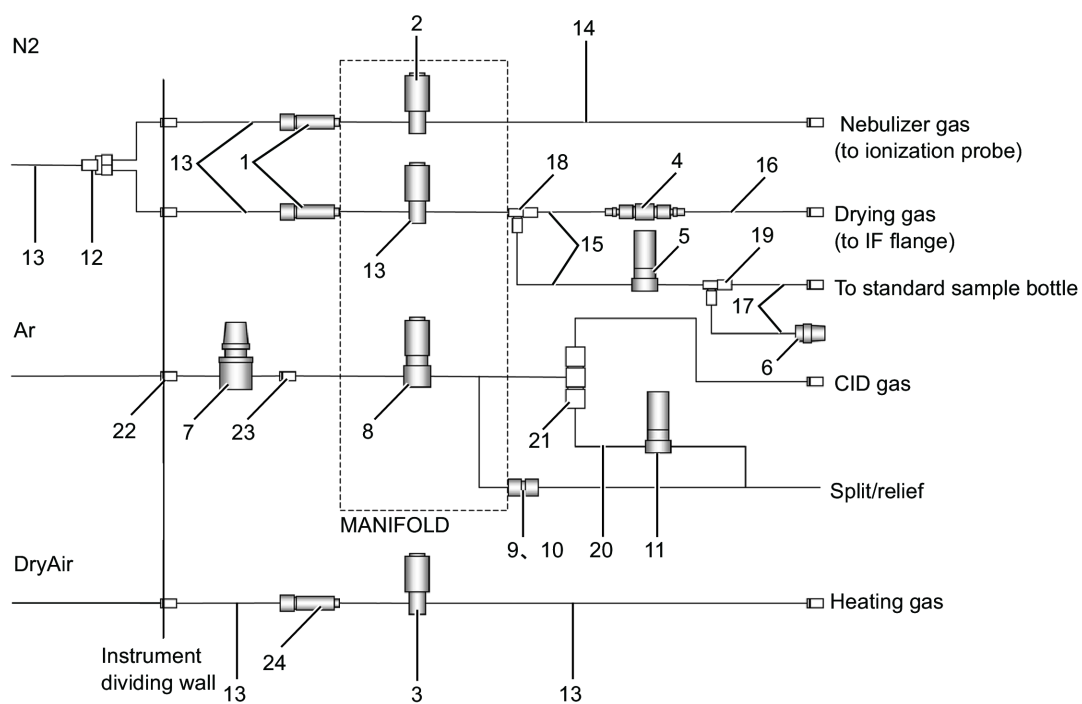
10.3.10 Standard Sample Introduction Unit

No.	Part Name	Part No.	Remarks
1	FRIT PEEK	S228-48607-91	One
2	CAPILLARY ASSY	S225-15848-91	
3	Standard sample bottle	S038-00512-01	
4	Spacer, FKM	S225-15697-01	
5	Bottle cap	S225-15868-91	
6	Standard sample	S225-14122-01	Standard sample solution, 200 mL
7	BRACKET, SI	S225-15560	
8	SCREW, SST FLAT HEAD M3X6	-	
9	HALF UNION, GWJS6-M5	S035-65415-06	
10	HOUSING, LINEFILTER	S228-46358	
11	MALE NUT, PEEK	S228-18565-84	5 included
12	PEEK TUBE 1.6X0.25	S228-32999-03	3 m (cut to 95 mm for use)
13	PEEK TUBE 1.6X0.25	S228-32999-03	3 m (cut to 400 mm for use)
14	TUBE, 0624304	S225-15873-91	Resistance tube
15	MAIL CONNECTER, PEEK	S228-25014	



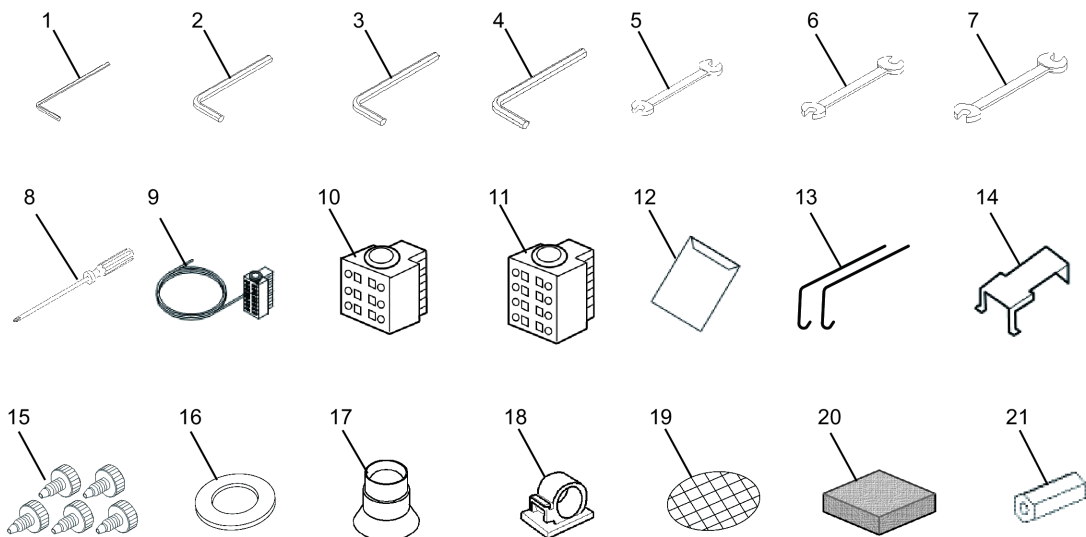
10.3.11 Gas Controller

No.	Part Name	Part No.	Remarks
1	FILTER, 2300B-SS-1/8-2U	-	
2	VALVE ASSY (NEB)	S040-51226-01	
3	VALVE ASSY (DRY)	S225-14292-41	
4	SUS316L 1.6X1.0X40	S228-49000-40	
5	Valve, SI	S225-15688-91	
6	VALVE, RELIEF RAB2V-150	S040-27013-01	
7	REGULATOR, AR10-M5BG	S040-72549-51	
8	VALVE ASSY SAGINOMIYA	S221-48813-91	
9	FILTER,PTFE 20 MICRON	S221-18154	
10	QUARTZ TUBE, TSP040375	S016-70402-01	
11	VALVE, RELIEF	S225-15688-42	
12	LATERAL, UNION KQ2U06-00	S035-60693-29	
13	FEP TUBE 6mm, GAS	S225-15846-93	
14	FEP TUBE 1/16, NEB	S225-14255-41	
15	FEP TUBE 4 mm, DRY	S225-14255-42	
16	FEP TUBE 1/16, DRY	S225-14255-43	
17	POLYURETHANE TUBE, U2-4-6X4BK	S016-46021	
18	TEE, RUN KQ2Y04-M5-ROHS	S035-60690-05	
19	TEE, RUN KQ2Y06-M5-ROHS	S035-60690-08	
20	TUBE, M5-MF 80MM	S221-41410-93	
21	3-WAY JOINT ASSY	S221-25211-91	
22	TUBE, M5-MF 260MM	S221-41410-94	
23	TUBE, M5-MF 200MM	S221-41410-92	
24	FILTER ASSY	S225-14042-41	



10.3.12 Accessory Parts

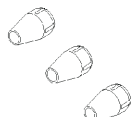
No.	Part Name	Part No.	Remarks
1	SPANNER, HEX 1.5 ROHS	-	
2	SPANNER, HEX 3 ROHS	-	
3	SPANNER, HEX 5 ROHS	-	
4	SPANNER, HEX 6 ROHS	-	
5	SPANNER, HX7-8-R	-	
6	SPANNER, HX10-12-R	-	
7	SPANNER, DOUBLE OPEN END17X19-R	-	
8	SCREWDRIVER, TORQUE #2 100MM	-	
9	CABLE, LCMS EVENT	S225-17126-41	
10	CONNECTER, 6 P	-	
11	CONNECTER, 8 P	-	
12	PEEK CAPILLARY 5999B	-	
13	DL PLUG 2	S225-25691	
14	JIG PULL	-	
15	MALE NUT, PEEK	S228-18565-84	
16	SPACER, FKM	S225-15697-01	
17	MAGNIFIER, 1962	-	
18	CLAMP, DKN-5GSP	-	
19	GUARD	-	
20	ABRASIVE CLOTH	-	
21	COUPLING, 1.6C 316L	-	



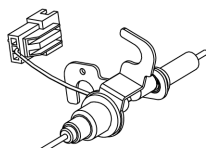
10.3.13 Startup Kit (Option)

No.	Part Name	Part No.	Remarks
1	FERRULE 1.6F	S228-33513-91	PEEK ferrule (total of 3)
2	DL ASSY2	S225-15718-42	For the LCMS-8050
3	PUMP OIL, H11025013	S017-30163-02	Rotary pump oil, 4 L
4	MALE NUT, PEEK	S228-18565-84	Male nut, 1.6 MN (total of 5)
5	FERRULE 1.6F-T	S228-16007-84	PTFE ferrule (total of 5)
6	PEEK CAPILLARY 5999B	-	ID0.13 mm PEEK tube, 3 m
7	ETFE TUBE 1.6X0.5	S228-18495-04	
8	FITTING	S228-32651-41	Nut, ferrule (5 each)
9	CAPILLARY ASSY	S225-14948-91	
10	SI BOTTLE LINE FILTER	S228-48607-91	
11	0.1 SUS PIPE	S228-49120-00	ID0.1 mm SUS pipe, 2 m
12	PEEK TUBE CUTTER	S228-32930-01	
13	FILTER	S042-60935-14	
14	GROVE, LATEX	S086-72599-01	
15	RESISTANCE TUBE, GLP CLEAN	S228-32722-94	

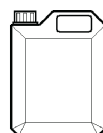
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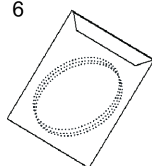
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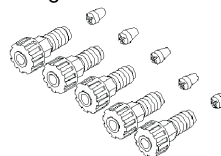
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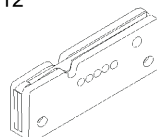
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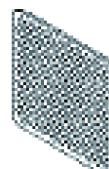
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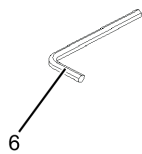
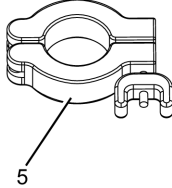
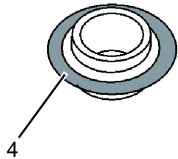
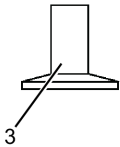
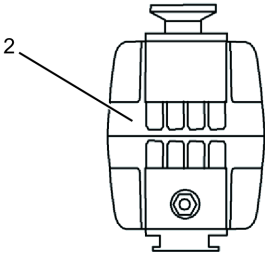
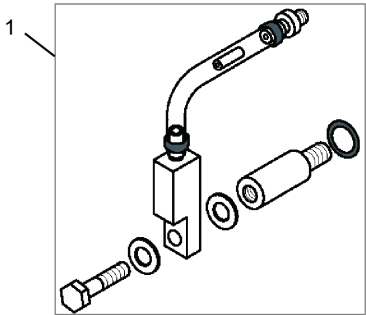


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10.3.14 RP Oil Return Kit (Option): S225-05990-92

No.	Part Name	Part No.	Remarks
1	OIL RETURN KIT, E2M28	-	
2	OIL MIST FILTER, EMF20	S042-00124-33	
3	FLANGE, KF25-#15 STRATE	-	
4	CENTERING RING,SNA7025	S035-06033-18	
5	CLAMP,SNK1025	S035-06033-37	
6	SPANNER, HEX 8 ROHS	-	



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